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Manual for Identification of Marine Invertebrates: A Guide to Some Common Estuarine Macroinvertebrates of the Big Bend Region, Tampa Bay, Florida

Conservation Consultants, Inc., Palmetto, FL

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In this guide, fourteen of the most commonly encountered marine animal phyla are presented by 233 taxa (196 species). Many of the species have wide distribution, including large regions of the Gulf of Mexico as well as portions of the southeast Atlantic coast. The guide presents the following: a list of taxa, photographs and descriptions for identifying each species, techniques of collection, preservation, and storage, a glossary, and bibliographies with references cited in the text and other publications which provide additional information on taxonomy and ecology.

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MANUAL FOR IDENTIFICATION OF MARINE INVERTEBRATES

A Guide to Some Common Estuarine Macroinvertebrates of the Big Bend Region, Tampa Bay, Florida

by

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ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

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FOREWORD

Environmental measurements are required to determine the quality of ambient water, the character of effluents, and the effects of pollutants on aquatic life. The Environmental Monitoring and Support Laboratory - Cincinnati conducts research to develop, evaluate, and promulgate methods to:

- Measure the presence and concentration of physical, chemical, and radiological pollutants in water, wastewater, bottom sediments, and solid waste.
- Concentrate, recover, and identify enteric viruses, bacteria, and other microorganisms in water.
- Measure the effects of pollution on freshwater, estuarine, and marine organisms, including the phytoplankton, zooplankton, periphyton, macrophyton, macroinvertebrates, and fish.
- Automate the measurement of physical, chemical, and biological quality of water.
- Conduct an Agency-wide quality assurance program to assure standardization and quality control of systems for monitoring water and wastewater.

The effectiveness of measures taken to maintain and restore the biological integrity of the Nation's surface waters is dependent upon our knowledge of the changes in the taxonomic composition of aquatic life caused by discharges of toxic substances and other pollutants, and upon the level of our understanding of the complex relationships that prevail in aquatic ecosystems. Estuarine invertebrates are important components of the benthic fauna. The varied response of individual species to different kinds of pollution and toxic substances also makes them very useful as water quality indicator organisms. This guide, which contains photographs and descriptions for 233 taxa, was developed to serve as a companion to the (1973) USEPA Biological Field and Laboratory Methods Manual, to assist aquatic biologists in analyzing samples collected from communities of estuarine macroinvertebrates.

Robert L. Booth
Director
Environmental Monitoring and Support
Laboratory - Cincinnati

ABSTRACT

In this guide, fourteen of the most commonly encountered marine animal phyla are represented by 233 taxa (196 species). Many of the species have wide distribution, including large regions of the Gulf of Mexico as well as portions of the southeast Atlantic coast. The guide presents the following: a list of taxa, photographs and descriptions for identifying each species, techniques of collection, preservation, and storage, a glossary, and bibliographies with references cited in the text and other publications which provide additional information on taxonomy and ecology.

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SECTION 1

INTRODUCTION

This guide is intended to be used as an identification aid for biologists with a limited knowledge of invertebrate taxonomy as well as those with more extensive training.

Most of the macroinvertebrates in this document were collected from soft bottom during a thermal environmental impact study of the Big Bend Region of Tampa Bay, Florida, from January, 1976 to April, 1977. Taxa included are limited to specimens that were considered common and only those in good working condition after processing.

Fourteen of the most commonly encountered marine invertebrate phyla are represented by 233 taxa (196 species). Many of the taxa presented have wide distribution that include large regions of the Gulf of Mexico as well as portions of the southeast Atlantic coast.

In addition to species descriptions, this guide contains sections discussing the geographic region covered, techniques of collection, preservation and storage, and taxonomic considerations. An extensive glossary defines the terms used in the text and also includes terms frequently used in taxonomic literature which are likely to be encountered. The bibliography, while not exhaustive, contains many important references for the less experienced investigators who require more in-depth reading.

Condensed taxonomic descriptions presented in the order of relative abundance of species in the samples provide the necessary information to identify a species, while the photographs provide a realistic image of the animal. Such a holistic approach is valuable in obtaining a rapid preliminary identification, with the description providing a more reliable basis for species determination.

SECTION 2

GEOGRAPHIC REGION COVERED

The Big Bend Region of the lower Hillsborough Bay is part of the Tampa Bay estuarine system (Figure 1). This large estuarine system is centrally located on the Florida West Coast. The climate of the area is subtropical, with bay waters supporting a unique blend of highly diverse marine life. The biota is composed of both temperate and tropical organisms.

The Tampa Bay bottom is a soft substrate consisting primarily of medium-grained quartz sands with some shell material (carbonate) and organic detritus (Goodell and Gorsline, 1960). A layer of fine silt-clay material of varying thickness covers the bottom of the deeper portions of the Bay as well as the shipping channels. The thickness of this silt-clay layer is greatest in Hillsborough Bay and somewhat less in other areas.

Large expanses of shallow, flat, sandy bottom often support rich seagrass communities. The abundant nutrients and detrital material offer an almost unlimited supply of food which supports a variety of species often at very high densities (Simon, 1974). There is a lack of hard substrate communities, the only natural substrate being mangrove roots and oyster beds. Man-made substrates, such as seawalls, bridge pilings and rock jetties, also provide habitat for aufwuch communities which may have a faunal composition quite different from the surrounding sediments (Mahadevan and Culter, 1977). The organisms described in this manual are primarily from the natural soft substrate communities. In terms of invertebrate types, polychaetes dominate all habitat types, with crustaceans (amphipods, cumaceans and isopods) the next most abundant, followed by molluscs, cephalochordates and echinoderms, with other invertebrate phyla usually present in minor numbers (Corps of Engineers, 1974).

The land surrounding Tampa Bay has been extensively developed. Tampa is the chief port and industrial center of the Florida West Coast. There have been many studies addressing the effect of man's perturbations. The first listing of invertebrates was provided by Hutton et al. (1956). Numerous other studies have since been conducted. A synopsis of the knowledge of the Tampa Bay system, with an extensive bibliography, was compiled by Simon (1974).

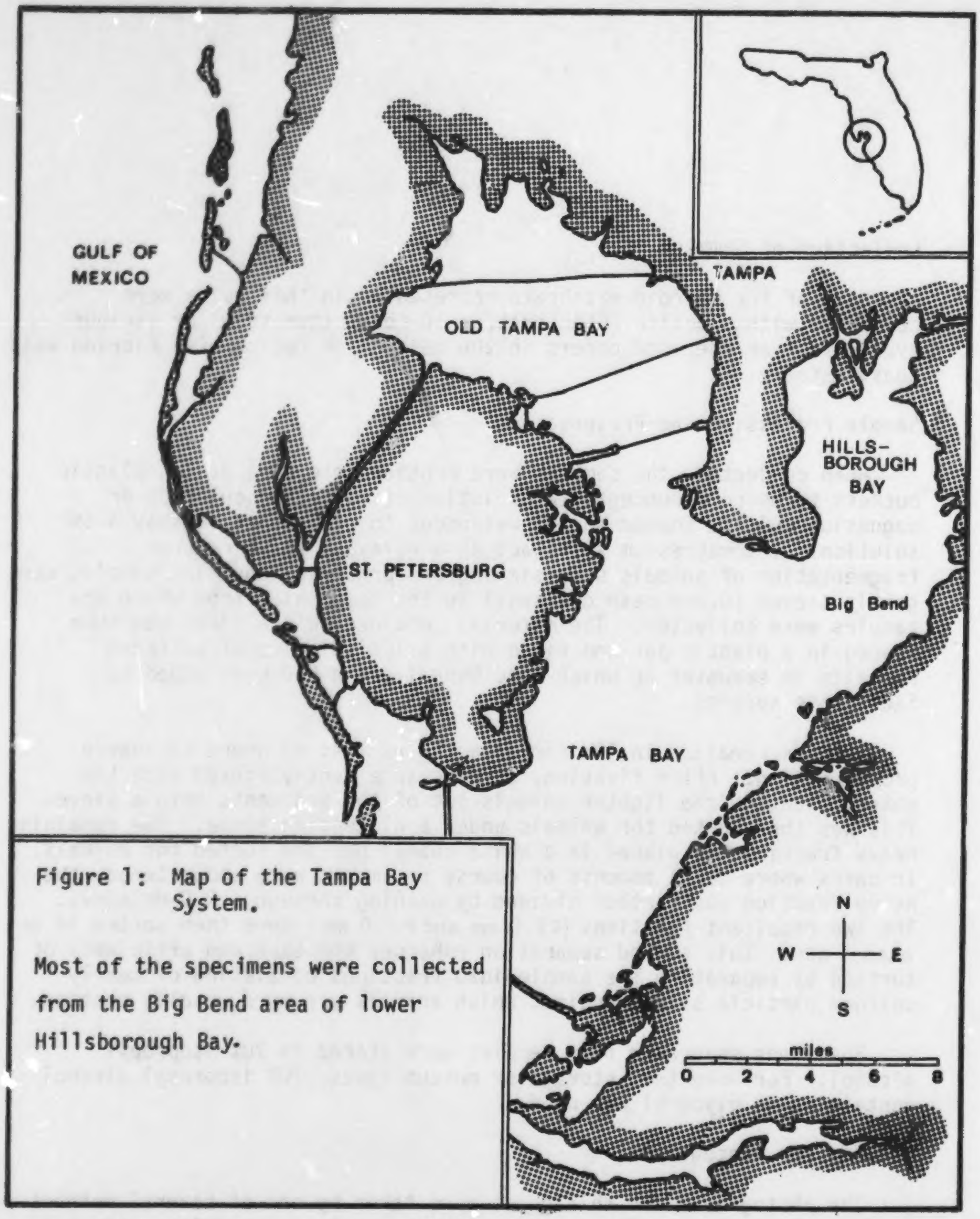

GULF OF MEXICO
TAMPA
OLD TAMPA BAY
HILLS-BOROUGH BAY
ST. PETERSBURG
Big Bend
TAMPA BAY
N
W
E
S
miles
0
2
4
6
8

Figure 1: Map of the Tampa Bay System.

Most of the specimens were collected from the Big Bend area of lower Hillsborough Bay.

SECTION 3

METHODS

Collection of Samples

Most of the macroinvertebrate represented in this guide were collected with a petite PONAR grab, a 10-foot otter trawl or various types of diver operated corers in the mesohaline region of a Florida west coast estuary.

Sample Processing and Preservation

When collected, the samples were emptied into five gallon plastic buckets to which a concentrated solution of magnesium chloride or magnesium sulfate (epsom salts) was added to give approximately a 5% solution. The magnesium salts act as a relaxant which reduces fragmentation of animals upon sieving and preservation. The samples were gently sieved (0.5mm mesh openings) in the same water from which the samples were collected. The material retained on the sieve was then placed in a plastic jar and fixed with a 10% solution of buffered formalin in seawater to which Rose Bengal stain had been added to facilitate sorting.

Samples remained in 10% formalin for at last 48 hours to insure proper fixing. After fixation, samples were gently rinsed with tap water, floating the lighter animals out of the sediments onto a sieve. This was then sorted for animals under a dissecting scope. The remaining heavy fraction was placed in a white enamal pan and sorted for animals. In cases where large amounts of coarse sediments were encountered, the heavy fraction was further divided by washing through a 2.0-mm sieve. The two resultant fractions ($<$2.0 mm and $>$ 2.0 mm) were then sorted in an enamel pan. This second separation enhances the ease and efficiency of sorting by separating the sample into fractions consisting of nearly uniform particle sizes, against which animals are more readily spotted.

Specimens separated from samples were stored in 70% isopropyl alcohol. For long term storage or museum types, 70% isopropyl alcohol containing 4% glycerol was used.

Methods for Photographs

The photographs for this guide were taken by one of several methods. A 35-mm single lens reflex camera with a normal or macro lens was used for specimens of suitably large size. For smaller specimens, an Olympus trinocular dissecting scope equipped with a Nikon Microflex system was used. Kodak Pan X (ASA 32) or Plus X (ASA 125) was exposed normally using electronic flash and/or a bare clear glass high intensity light bulb. The photographic background was either black or white, depending on the color, transparency and contrast exhibited by the specimen.

Taxonomic Considerations

This guide was not intended to include an exhaustive discussion of the systematics and taxonomy of the groups which are covered. Such an endeavor would encompass many volumes and defeat the very purpose of this manual. Nevertheless, an effort has been made to utilize the most recent classification schemes for the various groups (Barnes, 1974; Fauchald, 1977; Gosner, 1971; and Moore, 1956).

A more detailed systematic breakdown is provided for those groups that are most frequently encountered. In these cases, definitions for families are also given which may be useful in separating groups such as polychaetes, amphipods, and isopods which may all look alike to readers without extensive invertebrate experience. In cases where the groups are less complex, it was felt that including definitions for many systematic levels would not serve any useful purpose and could possibly be confusing. During benthic studie[illegible]dividuals are collected in all stages of growth, and juvenile specimens do not always exhibit all the characteristics needed to identify a species.

It is desirable and sometimes necessary to have taxonomic experts verify identifications. Some taxonomist experts request a fee, while others will examine specimens at no charge, provided large numbers of specimens are not involved. However, requests for assistance should always be made in advance of sending specimens.

Identification of invertebrates requires a large, diverse terminology. In order to avoid confusion, the simplest possible terminology was used for descriptions. This, in conjunction with the various illustrations and glossary, should enable the reader to fully comprehend descriptions in the text.

SECTION 4

LIST OF TAXA

- Phylum Porifera
  - Class Demospongiae
    - Order Hadromerida
      - Family Clionidae
        - *Cliona celata*
- Phylum Coelenterata (Cnidaria)
  - Class Hydrozoa
    - Order Athecata
      - Family Clavidae
        - Unidentified species
      - Family Eudendriidae
        - Unidentified species
    - Order Thecata
      - Family Campunularidae
        - Unidentified species
      - Family Campanulinidae
        - Unidentified species
  - Class Anthozoa
    - Order Actiniaria
      - Tribe Athenaria
        - Family Edwardsiidae
          - *Edwardsia* species
      - Tribe Thenaria
        - Family Actinostolidae
          - *Paranthus* species
    - Order Ceriantharia
      - *Cerianthus* species
- Phylum Platyhelminthes
  - Class Turbellaria
    - Order Polycladida
      - Family Stylochidae
        - *Stylochus* species
      - Family Leptoplanidae
        - *Euplana gracilis*
- Phylum Rhynchocoela (Nemertea)
  - Unidentified species
- Phylum Nematoda
  - Unidentified species
- Phylum Phoronida
  - *Phoronis architecta*
- Phylum Brachiopoda
  - Class Inarticulata
    - Order Lingulida
      - Family Lingulidae
        - *Glottidia pyramidata*
- Phylum Mollusca
  - Class Gastropoda
    - Subclass Prosobranchia
      - Order Mesogastropoda
        - Family Littorinidae
          - *Littorina irrorata*
        - Family Vitrinellidae
          - *Vitrinella helicoidea*
          - *Circulus suppressus*
          - *Cyclostremiscus pentagonus*
          - *Teinostoma lerema*
        - Family Caecidae
          - *Caecum imbricatum*
          - *Caecum johnsoni*
          - *Caecum nitidum*
          - *Caecum pulchellum*
        - Family Potamididae
          - *Cerithidea scalariformis*
        - Family Epitoniidae
          - *Epitonium angulatum*
          - *Epitonoim rupicola*
        - Family Melanellidae
          - *Melanella* species
          - *Strombiformis hemphilli*
        - Family Crepidulidae
          - *Crepidula fornicata*
          - *Crepidula maculosa*
          - *Crepidula plana*
        - Family Naticidae
          - *Polinices duplicatus*
          - *Sinum perspectivum*
          - *Natica pusilla*

- Family Muricidae
  - *Eupleura sulcidentata*
- Family Columbellidae
  - *Anachis obesa*
  - *Anachis semiplicata*
  - *Mitrella lunata*
- Family Buccinidae
  - *Pisania tincta*
- Family Melongenidae
  - *Melongena corona johnstonei*
- Family Nassariidae
  - *Nassarius vibex*
- Family Olividae
  - *Oliva sayana*
  - *Oivella perplexa*
- Family Marginellidae
  - *Marginella apicina*
- Order Pyramidelloida
- Family Pyramidellidae
  - *Odostomia impressa*
  - *Turbonilla conradi*
- Subclass Opisthobranchia
- Order Cephalaspidea
- Family Acteonidae
  - *Acteon punctostriatus*
- Family Acteocinidae
  - *Acteocina canaliculata*
- Family Haminoeidae
  - *Haminoea succinea*
  - *Haminoea antillarum*
- Order Nudibranchia
- Family Dotodae
  - Unidentified species
- Subclass Pulmonata
- Order Basommatophora
- Family Melampidae
  - *Melampus coffeus*
- Class Bivalvia
- Subclass Prionodesmata
- Order Protobranchia
- Family Nudulidae
  - *Nucula crenulata*
- Subclass Pteriomorphia
- Order Arcoida
- Family Arcidae
  - *Anadara transversa*
- Family Glycymerididae
  - *Glycymeris pectinata*
- Order Mytiloida
- Family Mytilidae
  - *Branchidontes exustus*
  - *Musculus lateralis*
  - *Amygdalum papyrium*
- Family Pinnidae
  - *Atrina rigida*
- Order Pterioida
- Family Ostreidae
  - *Crassostrea virginica*
- Order Veneroida
- Family Lucinidae
  - *Parvilucina multilineata*
  - *Lucina nassula*
- Family Cyrenoididae
  - *Cyrenoida floridana*
- Family Leptonidae
  - *Mysella planulata*
- Family Crassatellidae
  - *Crassinella lunulata*
- Family Cardiidae
  - *Laevicardium mortoni*
  - *Dinocardium robustum vanhyningi*
- Family Mactrodae
  - *Mactra fragilis*
  - *Mulinia lateralis*
- Family Solenidae
  - *Ensis minor*
- Family Tellinidae
  - *Tellina lineata*
  - *Tellina versicolor*
  - *Macoma tenta*
- Family Semelidae
  - *Semele purpurascens*
  - *Abra aequalis*
- Family Solecurtidae
  - *Tagelus divisus*
  - *Tagelus plebius*
- Family Dreissenidae
  - *Mytilopsis leucophaeata*
- Family Veneridae
  - *Mercenaria campechiensis*
  - *Macrocallista nimbosa*
  - *Cyclinella tenuis*
  - *Dosinia discus*
  - *Parastarte triquetra*
- Order Myoida
- Family Myidae
  - *Sphenia antillensis*
- Family Corbulidae
  - *Corbula contracta*
  - *Corbula swiftiana*
- Family Pholadidae
  - *Cyrtopleura costata*

Order Eudesmodontida
Family Lyonsiidae
Lyonsia hyalina floridana
Family Periplomatidae
Periploma margaritaceum

Phylum Annelida
Class Polychaeta
Order Phyllodocida
Family Polynoidae
Harmothoe species
Family Sigalionidae
Stenelais boa
Family Chrysopetalidae
Paleanotus heteroseta
Family Phyllodocidae
Eteone heteropoda
Eulalia species
Eumida sanguinea
Phyllodoce arenae
Phyllodoce fragilis
Family Hesionidae
Gyptis vittata
Parahesione luteola
Family Pilargiidae
Ancistrosyllis jonesi
Sigambra bassi
Sigambra tentaculata
Family Syllidae
Autolytus species
Exogone species
Typosyllis species
Family Nereidae
Laeonereis culveri
Nereis succinea
Neanthes acuminata
Nereis arenaceodonta
Family Nephtyidae
Nephtys magellanica
Aglaophamus verrilli
Family Glyceridae
Glycera americana
Glycera dibranchiata
Family Goniadidae
Glycinde solitaria
Order Spionida
Family Eunicidae
Eunice species
Marphysa sanguinea
Family Onuphidae
Diopatra cuprea
Onuphis eremita oculata
Family Lumbrineridae
Lumbrineris species
Family Spionidae
Polydora ligni
Polydora socialis
Paraprionospio pinnata
Prionospio heterobranchia
Spio pettiboneae
Family Chaetopteridae
Chaetopterus variopedatus
Spiochaetopterus costarum oculatus
Order Orbiniida
Family Orbiniidae
Scoloplos foliosus
Scoloplos rubra
Order Capitellida
Family Opheliidae
Travisia hobsonae
Order Terebellida
Family Terebellidae
Pista cristata
Class Oligochaeta
Order Haplotaxida
Family Tubificidae
Aktedrilus monospermathecus
Limnodriloides winckelmanni
Limnodriloides species
Tubificoides c.f. *wasselli*
Tubificoides species

Phylum Sipuncula
Family Golfingiidae
Phascolion strombi

Phylum Arthropoda
Class Pycnogonida (Pantopoda)
Family Phoxichilidiidae
Anaplodactylus pygmaeus
Class Merostomata
Subclass Xiphosura
Order Xiphosurida
Family Limulidae
Lumulus polyphemus
Class Crustacea
Subclass Cephalocarida
Hutchinsoniella macracantha
Order Remitedia

- *Lightiella floridana*
- Subclass Ostracoda
  - Order Podocopida
    - Family Cytherideidae
      - *Haplocytherida setipunctata*
  - Order Myodocopina
    - Family Cylindroleberididae
      - *Parasterope pollex*
    - Family Sarsiellidae
      - *Sarsiella zostericola*
- Subclass Cirripedia
  - Order Thoracica
    - Suborder Balanomorpha
      - Family Balanidae
        - *Balanus amphitrite*
- Subclass Malacostraca
  - Order Nebaliacea
    - *Nebalia* species
  - Order Stomatopoda
    - Family Squillidae
      - *Squilla empusa*
  - Order Mysidacea
    - Suborder Mysida
      - Family Mysidae
        - *Bowmaniella dissimilis*
        - *Mysidopsis almyra*
        - *Mysidopsis bigelowi*
  - Order Cumacea
    - Family Bodotriidae
      - *Cyclaspis varians*
    - Family Leuconidae
      - *Leucon acutirostris*
    - Family Nannastacidae
      - *Cumella garriti*
    - Family Diastylidae
      - *Oxyurostylis smithi*
  - Order Tanaidacea
    - Unidentified species
  - Order Isopoda
    - Suborder Anthuridea
      - Family Anthuridae
        - *Apanthura magnifica*
        - *Cyathura polita*
        - *Xenanthura brevitelson*
    - Suborder Valvifera
      - Family Idoteidae
        - *Aegathoa oculata*
        - *Edotea montosa*
        - *Erichsonella filiformis isabelensis*
      - Family Sphaeromidae
        - *Cymodoce faxoni*
        - *Dynamenella dianae*
        - *Sphaeroma quadridentatum*
    - Suborder Asellota
      - Family Munnidae
        - *Munna* species
  - Order Amphipoda
    - Suborder Gammaridea
      - Family Gammaridae
        - *Gammarus mucronatus*
        - *Elasmopus levis*
      - Family Melitidae
        - *Melita nitida*
        - *Melita* species
      - Family Liljeborgiidae
        - *Listriella* c.f. *barnardi*
      - Family Bateidae
        - *Batea catharinensis*
      - Family Stenothoidae
        - *Stenothoe* c.f. *minuta*
        - *Parametopella cypris*
      - Family Leucothoidae
        - *Leucothoe* species
      - Family Oedicerotidae
        - *Monoculodes edwardsi*
        - *Monoculodes nyei*
      - Family Haustoriidae
        - *Acanthohaustorius* species
      - Family Argissidae
        - *Argissa* species
      - Family Phoxocephalidae
        - *Paraphoxus* c.f. *spinosus*
        - *Trichophoxus floridanus*
      - Family Atylidae
        - *Nototropus* sp.
      - Family Ampeliscidae
        - *Ampelisca abdita*
        - *Ampelisca holmesii*
      - Family Lysianassidae
        - *Lysianopsis alba*
      - Family Aoridae
        - *Grandidierella bonnieroides*
        - *Lembos smithi*
        - *Microdeutopus* species
        - *Rudilemboides naglei*
      - Family Amphithoidae
        - *Cymadusa* c.f. *compta*
      - Family Amphilochidae
        - *Gitanopsis* species
      - Family Corophiidae
        - *Cerapus* species

Corophium c.f. *acherusicum*
Corophium c.f. *lacustre*
Corophium c.f. *louisianum*
Ericthonius c.f. *brasiliensis*
Family Podoceridae
Podocerus species
Order Decapoda
Suborder Natantia
Family Penaeidae
Trachypeneus constrictus
Family Sergestidae
Lucifer faxoni
Family Palaemonidae
Periclimines ameracanus
Family Alpheidae
Automate species
Alpheus normani
Alpheus species
Leptalpheus forceps
Family Ogyrididae
Ogyrides limicola
Family Hippolytidae
Latreutes parvulus
Family Processidae
Ambidexter symmetricus
Hippolyte zostericola
Suborder Reptantia
Family Callianassidae
Callianassa atlantica
Family Porcellanidae
Petrolisthes galathinus
Euceramus praelongus
Family Paguridae
Unidentified species
Family Albuneidae
Lepidopa websteri
Family Leucosiidae
Persephona punctata aquilonaris
Family Xanthidae
Menippe mercenaria
Neopanope texana texana
Panopeus herbstii
Family Pinnotheridae
Pinnixa chaetopterana
Pinnixa retinens
Pinnixa sayana

Phylum Echinodermata
Class Asteroidea
Order Paxillosida
Family Asteropectinidae
Astropecten articulatus
Order Platyasterida
Family Luidiidae
Luidia clathrata
Order Spinulosida
Family Echinasteridae
Echinaster species
Class Echinoidea
Order Arbacioida
Family Arbaciidae
Arbacia punctulata
Order Temnopleurida
Family Toxopneustidae
Lytechinus variegatus
Order Clypeasteroida
Family Mellitidae
Mellita quinquiesperforata
Class Ophiuroidea
Order Ophiurida
Family Amphiuridae
Amphioplus abditus
Amphioplus thrombodes
Amphipholis squamata
Micropholis atra
Micropholis gracillima
Hemipholis elongata
Ophiophragmus filograneus
Ophiophragmus wurdemani

Phylum Hemichordata
Class Enteropneusta
Family Harrimaniidae
Stereobalanus canadensis

Phylum Chordata
Subphylum Urochordata
Class Ascidiacea
Order Pleurogona
Family Molgulidae
Bostrichobranchus pilularis
Molgula occidentalis

SECTION 5

PHYLUM MOLLUSCA

Definition: Molluscs are highly modified coelomates with a soft body consisting of three principal parts; the mantle, a fold of the body wall which secretes a calcareous shell in most species and encloses; the visceral mass which contains the digestive, and other organ systems; and the foot, a muscular organ of locomotion. A pharynx is present and in some classes is provided with a toothed band, the radula.

This phylum is one of the largest groups, second only to the Arthropoda in number of species. They are highly variable in form and occupy a multitude of habitats. They can be predators, scavengers, herbivores, detrital feeders, filter feeders and parasites. Certain species (especially bivalves) often occur in very high densities, while other species may be relatively rare. For the shelled molluscs, taxonomic characteristics are primarily based on shell morphology, and scars on the inside of the shells left by the soft tissue. It is possible, therefore, to identify fossil shells or shells of animals which have died out in a given locality. Difficulties in identification may be compounded by varying degrees of intraspecific morphological variation.

There has been a great deal of information amassed by other authors concerning the Mollusca. Of the seven generally recognized classes of molluscs, only two, the Gastropoda and the Bivalvia are treated here.

CLASS GASTROPODA - Snails and Slugs (Figures 4-41)

SUBCLASS PROSOBRANCHIA

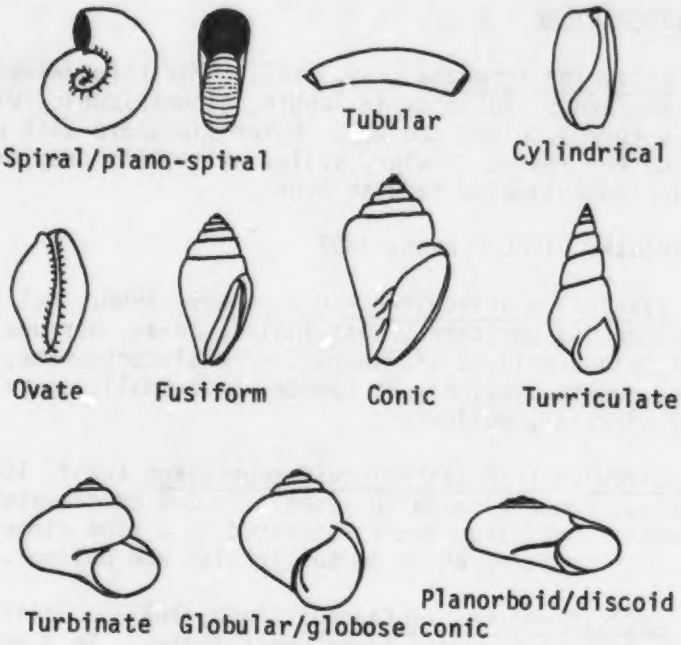
Definition: Asymmetrical molluscs with well developed head bearing eyes and tentacles; radula present; ventral part of the foot flattened to a creeping sole; generally with a univalved, spiral shell (may be lacking); monoecious or dioecious; development variable.

Primarily predators, herbivores or scavengers, gastropods are usually not numerically dominant benthic inhabitants. Figure 2 illustrates some basic gastropod shell configurations, while Figure 3, a composite, exhibits important shell features used for identification.

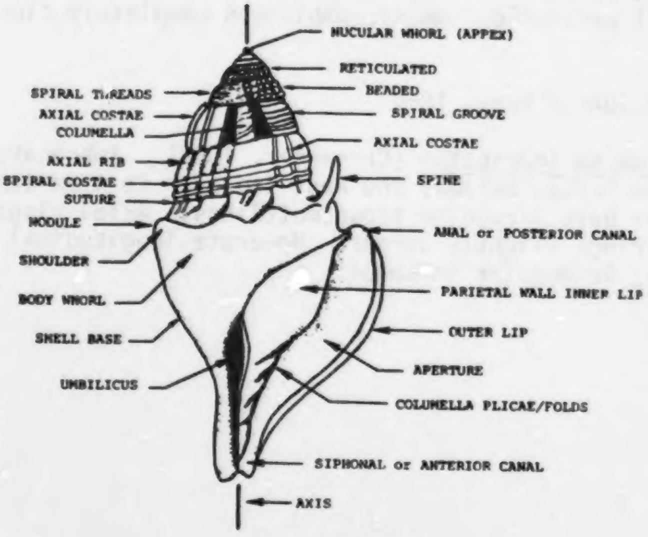
Fig. 2. Basic gastropod shell configurations.

Fig. 3. Composite gastropod shell illustrating characteristics used for species identification.

PLATE 1 (Figures 2-3)


Spiral/plano-spiral
Tubular
Cylindrical
Ovate
Fusiform
Conic
Turriculate
Turbinate
Globular/globose
Planorboid/discoid conic

2


NUCULAR WHORL (APPEX)
RETICULATED
SPIRAL THREADS
BEADED
AXIAL COSTAE
SPIRAL GROOVE
COLUMELLA
AXIAL COSTAE
AXIAL RIB
SPINE
SPIRAL COSTAE
SUTURE
NODULE
ANAL or POSTERIOR CANAL
SHOULDER
BODY WHORL
PARIETAL WALL INNER LIP
SHELL BASE
OUTER LIP
APERTURE
UMBILICUS
COLUMELLA PLICAE/FOLDS
SIPHONAL or ANTERIOR CANAL
AXIS

3

CLASS GASTROPODA

SUBCLASS PROSOBRANCHIA

ORDER MESOGASTROPODA

FAMILY LITTORINIDAE - Gray, 1840

Fig. 4. *Littorina irrorata* (Say, 1822). Marsh Periwinkle. New York to Florida to Texas. To 25 mm in length, globose/conic, with numerous regularly formed spiral grooves. Outer lip sharp with pigmented grooves on the inside. Color, yellow white with grey brown streaks. Inner lip and columella reddish brown.

FAMILY VIRTRINELLIDAE - Bush, 1897

Fig. 5. *Vitrinella helicoidea* - C.B. Adams, 1950. Helix Vitrinella. Southeastern United States, West Indies, Texas, Bermuda. To 2 mm diameter, planorboid, 2 1/2 whorls. Translucent-white, glassy. Umbilicus round, deep, may be bounded by a small, spiral sculpture. Aperture circular, oblique.

Fig. 6. *Circulus (Cyclostremiscus) suppressus* (Dall, 1889). Suppressed Vitrinella. South Florida to Texas. To 2.0 mm diameter, planorboid, 3 sharp keels. Umbilicus small, bordered by a fine ridge which joins the base of the aperture, which is subcircular and oblique.

Fig. 7. *Cyclostremoscus pentagonus* (Gabb, 1873). Trilix Vitrinella. North Carolina to Florida, Texas, West Indies. To 3 mm diameter, planorboid, 3 keels. Umbilicus deep, funnel shaped. Aperture circular, oblique. Yellow-white color with visible growth lines.

Fig. 8. *Teinostoma lerema* (Pilsbry & McGinty, 1945). Virgin Islands, Florida Keys, West Florida, Texas. 1.4 mm diameter, planorboid, white, glassy. 1 postnuclear whorl, umbilicus completely closed by a thick callus.

FAMILY CAECIDAE - Gray, 1850

Fig. 9. *Caecum imbricatum* (Carpenter, 1858). Imbricate Caecum. Florida to Texas, Bahamas and West Indies. To 4 mm length, opaque white, may have irregular brown mottlings. Axial rings flattened with terminal rings slightly larger. Moderate longitudinal ridges. Mucro prominent, triangular in shape.

PLATE 2 (Figures 4-9)

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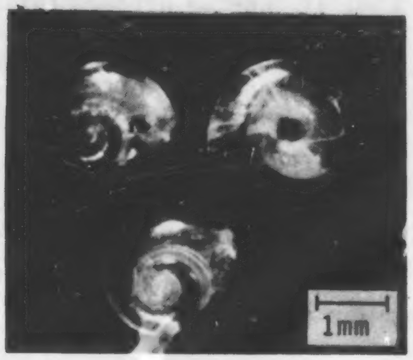

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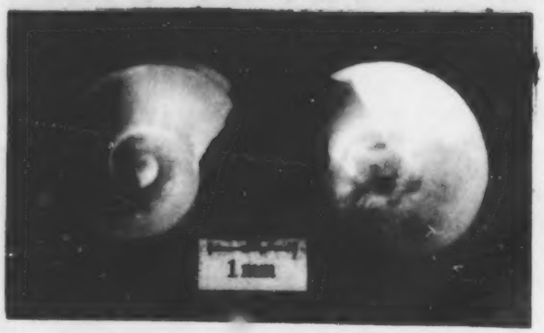

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Fig. 10. *Caecum johnsoni* (Winkley, 1908). Johnsons Caecum. Massachusetts to North Carolina, Florida and Texas. 2-3 mm length, slender, smooth and cylindrical. Nearly transparent, septum strongly convex which may have a rough surface. Fine axial rings sometimes visible.

Fig. 11. *Caecum nitidum* (Stimpson, 1851). Little Horn Caecum. South Florida and the Gulf Coast to the West Indies and Brazil. To 3 mm in length, white irregular brown specks or mottlings, bulbous at center or slightly anterior of center. Septum with a small projection on the highest side.

Fig. 12. *Caecum pulchellum* (Stimpson, 1851). Beautiful Little Caecum. New Hampshire to Brazil. To 3 mm in length, tan to white color. 20-30 axial rings, as wide as spaces between. Septum is slightly convex, the mucro small and only slightly projecting.

FAMILY POTAMIDIDAE

Fig. 13. *Cerithidea scalariformis* (Say, 1825). Ladder Horn Shell. South Carolina to Florida and the West Indies. To 32 mm in length. Turriculate, with 10-30 convex whorls. Brown with white spiral bands. Numerous axial ribs which stop abruptly above the suture which contains a rounded spiral ridge. Base of shell with 6-8 spiral ridges.

FAMILY EPITONIIDAE - S. S. Berry, 1910

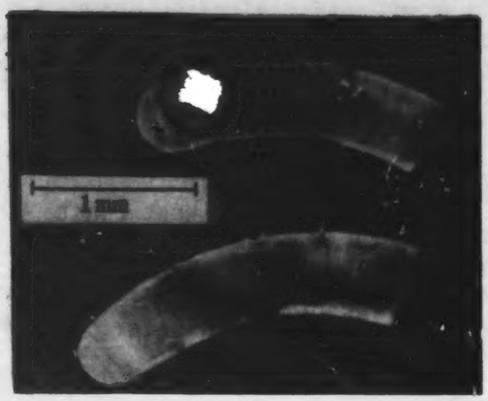
Fig. 14. *Epitonium angulatum* (Say, 1830). Angulate Wentletrap. New York to Florida and to Texas, Bermuda. To 25 mm in length, strong, without an umbilicus. 8 whorls with 9-10 strong thin costae slightly bent backwards and angled at the shoulder. Costae are in line from whorl to whorl and fused at the suture. Outer lip is thickened, color is glossy white.

Fig. 15. *Epitonium rupicola* (Kurtz, 1860). Brown-banded Wentletrap. Massachusetts to Florida to Texas. Specimen 8.2 mm long, relatively slender, without an umbilicus. White to cream color with a brown band on each side of suture. 9-11 globose whorls, each with 12-18 costae of variable strength.

FAMILY MELANELLIDAE - Bartsch, 1917

Fig. 16. *Melanella sp*. Length 3.5 mm, fusiform with 9 whorls, bending slightly near apex. White, glossy smooth. No sculpture present, sutures indistinct.

PLATE 3 (Figures 10-16)



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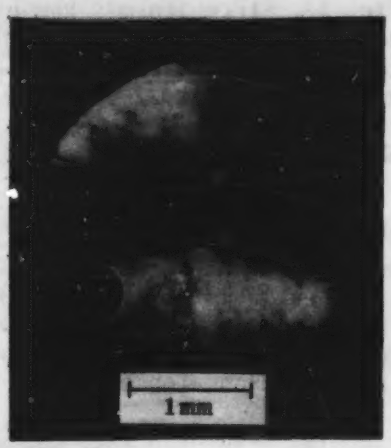

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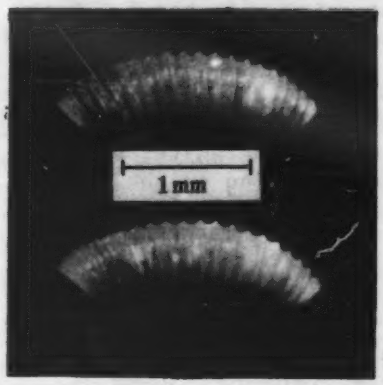

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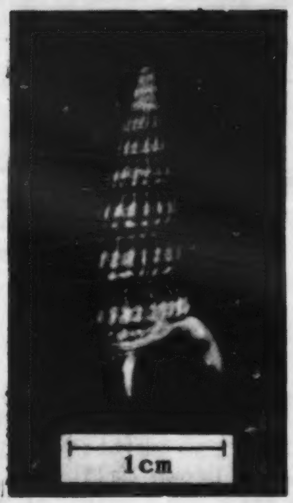

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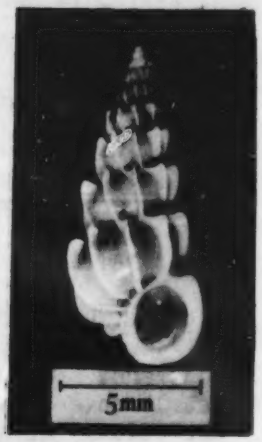

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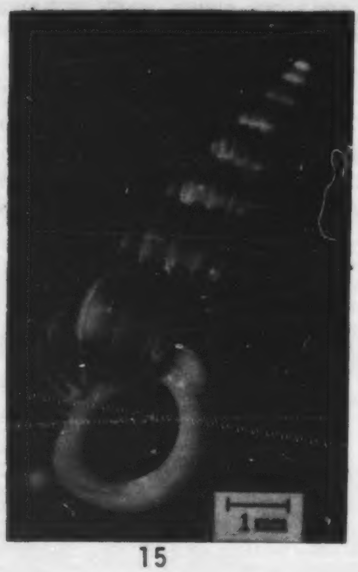

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Fig. 17. *Strombiformis hemphilli* (Dall, 1844). Hempills Melanella. West Coast of Florida; Brazil. Length 3.4 mm, conic, slender, brown color, glassy smooth. 8 flat sided whorls, suture distinct, with a brown band below. Columella slightly concave.

FAMILY CREPIDULIDAE - Fleming, 1822

Fig. 18. *Crepidula fornicata* (Linne, 1758). Common Atlantic Slipper-shell. Canada to Florida and Texas; introduced to West Coast and Europe. 5-50 mm long. Color grey-white, sometimes having brown blotches or lines. Shape variable, moderately flat to highly arched. Shell deck encloses posterior half of inside of shell. Deck slightly concave, usually white, and notched in 2 places. Specimens usually found stacked atop one another.

Fig. 19. *Crepidula maculosa* - Conrad, 1846. Spotted Slipper-shell. East and West Coast of Florida and Bahamas. Specimen 5 mm in length, similar to *C. fornicata*. Usually spotted or streaked with brown. Deck is flat with edge being straight or slightly concave. Shape moderately flat to highly arched.

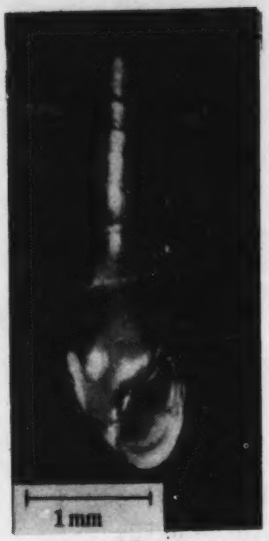
Fig. 20. *Crepidula plana* - Say, 1822. Eastern White Slipper-shell. Canada to Texas, Brazil and Bermuda. 2-30 mm in length, white, very flat. Usually attached to shell material. Deck covering slightly less than half of shell, slightly convex edge with a notch on one edge. Tiny specimens may be translucent.

FAMILY NATICIDAE - Gray, 1840

Fig. 21. *Polinices duplicatus* (Say, 1822). Shark Eye. Massachusetts to Florida and the Gulf Coast. 10-40 mm diameter, globose, somewhat flattened. Grey to tan, base white; Glossy-smooth. Umbilicus deep, nearly covered by a large brown callus. Large aperture with a brown operculum. A. Apical view. B. Adapical view. C. Lateral view.

Fig. 22. *Sinum perspectivum* (Say, 1831). Common Baby's Ear. Maryland to Florida, Gulf Coast and the West Indies; Bermuda and Brazil. Up to 50 mm in diameter. Very flat, large aperture, white color. Numerous fine spiral lines on top of whorls. Animal fully covers shell when alive. Preserved specimens often coated with a copious amount of mucus.

PLATE 4 (Figures 17-22)



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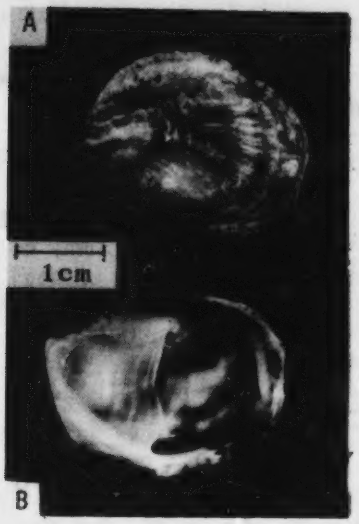

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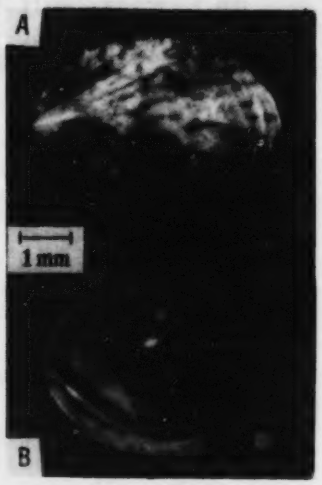

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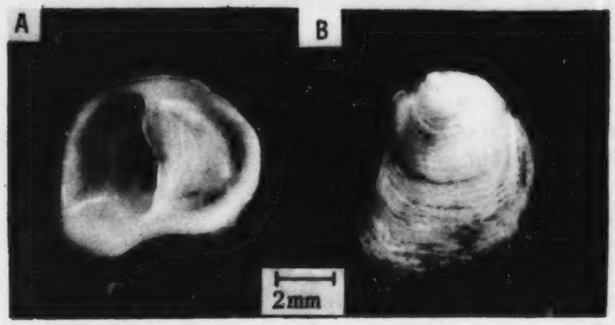

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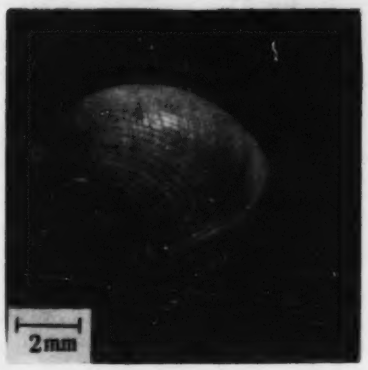

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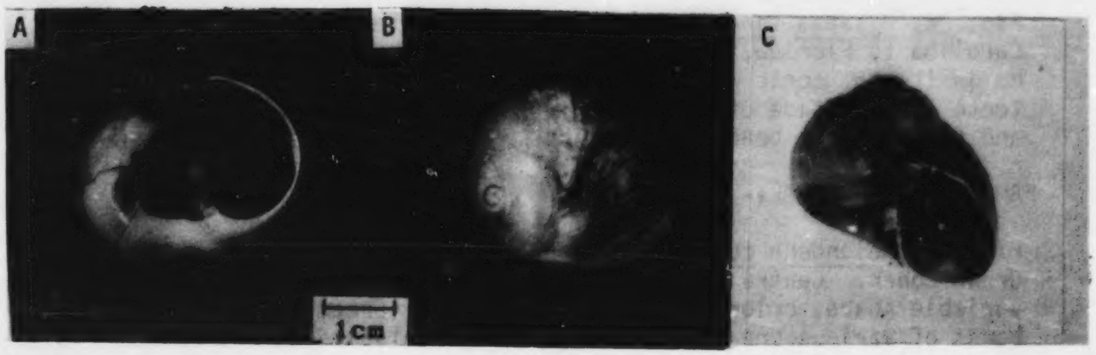

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Fig. 23. *Natica pusilla* - Say, 1822. Southern Miniature Natica. Maine to Florida, Gulf Coast to Brazil. To 8 mm in length. Ovate, glossy-smooth, white to grey, may have light brown markings. Umbilicus sealed with a flat callus. Calcareous operculum.

FAMILY MURICIDAE - de Costa, 1776

Fig. 24. *Eupleura sulcidentata* - Dall, 1890. Sharp-ribbed Drill. West Coast of Florida, Bimini. Specimen 12.5 mm, off-white to grey. Apex pointed, moderately long, nearly closed siphonal canal. Varices thin and sharp, spiral sculpture nearly absent. Axial ribs often sharp and a small spine may be present at top. Outer lip thick, rough, with about 5 smooth teeth on the inside.

FAMILY COLUMBELLIDAE - Swainson, 1840

Fig. 25. *Anachis obesa* (C.B. Adams, 1845). Fat Dove-shell. Virginia to Florida to Texas and to Uruguay. Bermuda. To 6 mm in length, stout, ovate conical, light to dark brown, may have spiral brown bands. Numerous axial ribs, and spiral cords result in a reticulated pattern. Aperture elongate. 3-5 small teeth on inside of outer lip.

Fig. 26. *Anachis semiplicata* - Stearns, 1873. Semiplicate Dove-shell. West Florida to Yucatan, Mexico. To 13 mm in length, slender, fusiform (width to length ratio = 0.37). Spire acute, flat sided. Body whorl with about 12 axial ribs, spire sculpture reduced. Aperture narrow. Grey with fine brown reticulations, outer lip white.

Fig. 27. *Mitrella lunata* - (Say, 1826). Lunar Dove-shell. Massachusetts to Florida, Texas, Brazil, West Indies. Length 3.0 mm, smooth glossy-white to grey, with brown axial zigzag stripes. Aperture long, compressed with several small teeth on inside of outer lip. Spiral striations on base of shell.

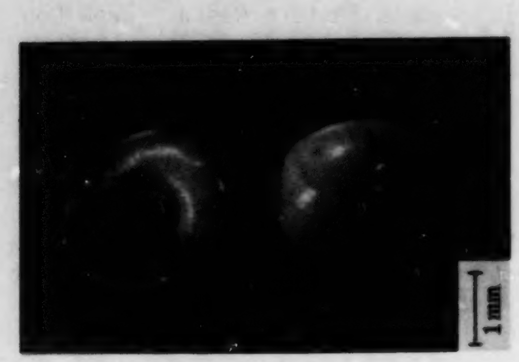
FAMILY BUCCINIDAE - Rafinesque, 1815

Fig. 28. *Pisania tincta* (Conrad, 1846). Tinted Cantharus. North Carolina to Florida, Texas, the West Indies. Bermuda. Brazil. To 32 mm in length, conic heavy. Posterior siphonal canal present, small teeth along inside of outer lip. Spiral costae and axial ribs present and forming weak beads at crossings. Color variable, usually mixed.

FAMILY MELONGENIDAE - Gill, 1867

Fig. 29. *Melongena corona johnstonei* - Clench and Turner, 1956. Common Crown Conch. Central West Florida to Alabama. To 190 mm in length, variable shape, color and number of spines. Cream, with wide spiral bands of various brown shades. Shoulder flattened with erect semitubular spines.

PLATE 5 (Figures 23-29)



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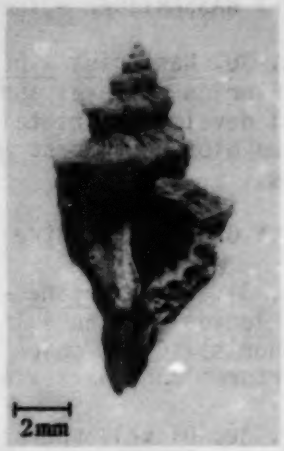

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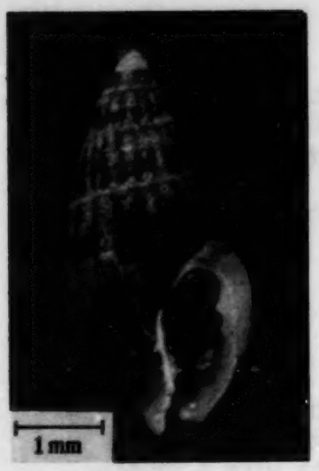

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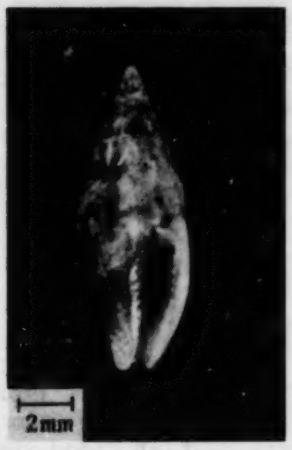

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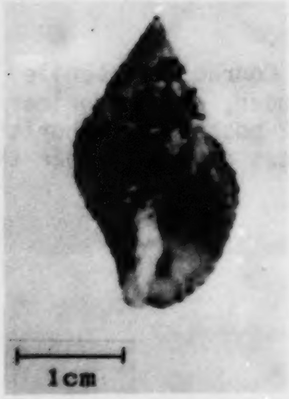

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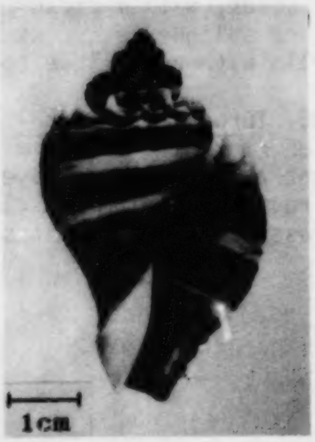

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FAMILY NASSARIIDAE - Iredale, 1916

Fig. 30. Nassarius vibex (Say, 1822). Common Eastern Nassa. Cape Cod to Florida to Texas and the West Indies to Brazil. 10 mm long, heavy, well developed parietal shield. Grey brown to white with some dark brown blotches. Last whorl with about a dozen coarsely beaded axial ribs.

FAMILY OLIVIDAE - Latreille, 1825

Fig. 31. Oliva sayana - Ravenel, 1834. Lettered Olive. North Carolina to Florida and the Gulf states. To 60 mm in length, elongate with 5 to 6 whorls. Cream color with extensive brown markings, glassy finish. Aperture long, narrow with thin outer lip. Columella is plicated.

Fig. 32. Olivella perplexa - Olsson, 1956. Tiny Dwarf Olive. South Florida. Specimen 3 mm in length, glossy white with an elevated spire. Shell heavy, parietal callus thick. Suture deeply channeled.

FAMILY MARGINELLIDAE - Fleming, 1828

Fig. 33. Marginella apicina - Menke, 1828. Common Atlantic Marginella. North Carolina to Florida, the Gulf states and the West Indies. 8 mm in length, glossy with a dark nuclear whorl. Aperture elongate, narrow, with a white thickened outer lip. Color is cream to brown with faint bands of darker color. Usually several brown spots on outer lip.

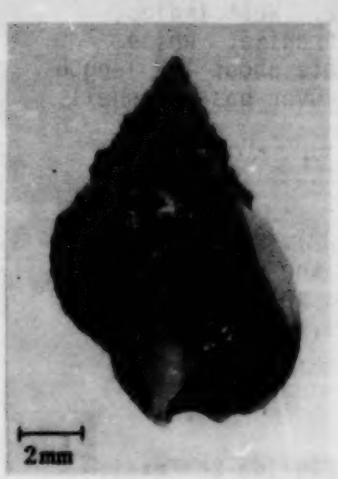
ORDER PYRAMIDELLOIDA

FAMILY PYRAMIDELLIDAE - Gray, 1840

Fig. 34. Odostomia impressa (Say, 1821). Impressed Odostome. Massachusetts to the Gulf of Mexico. To 6 mm in length, elongate conic, white. Six-seven nearly flat sided whorls each with 4 smooth spiral cords, with microscopic axial threads between. Nuclear whorl small and oblique to successive whorl. Aperture elongate, oval. Columella with an oblique fold.

Fig. 35. Turbonilla conradi - Bush, 1899. Conrad's Turbonile. West Coast of Florida. To 10 mm in length, slender, gray. Nuclear whorls at right angle to successive whorls. 11-12 postnuclear whorls with 18-24 rounded axial ribs. Intercostal spaces shallow, wider than ribs and crosssd by incised lines.

PLATE 6 (Figures 30-35)



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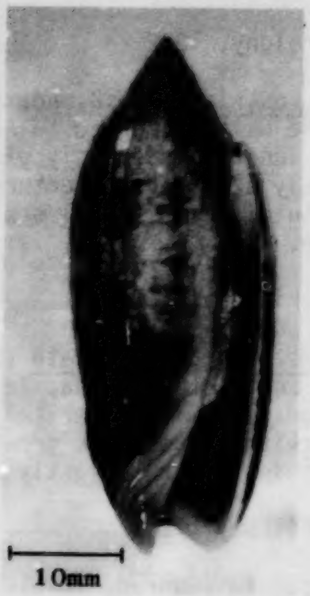

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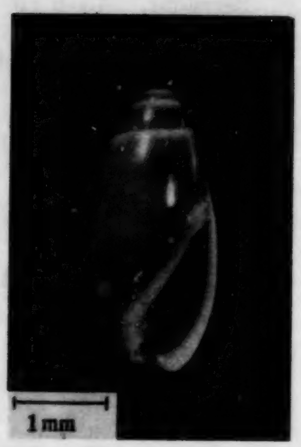

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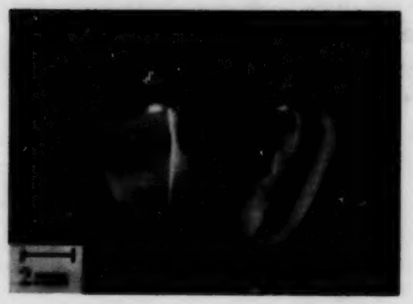

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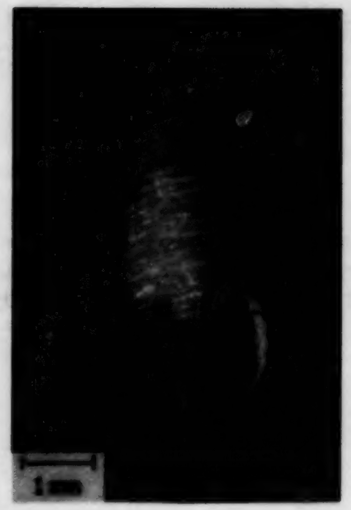

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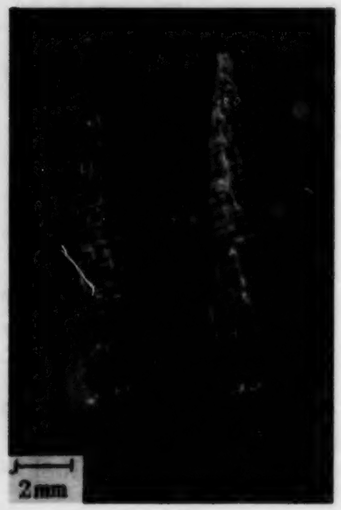

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SUBCLASS OPISTHOBRANCHIA

ORDER CEPHALASPIDEA

FAMILY ACTEONIDAE - Orbigny, 1842

Fig. 36. *Aceteon punctostriatus* (C.B. Adams, 1840). Adam's Baby-bubble *Cape Cod to the Gulf of* Mexico to Argentina. West Indies, Bermuda. To 6 mm in length, moderately globose, fragile. White color, spire moderately elevated. Aperture elongate about 1/2 length of shell, outer lip thin. Fine spiral striations over base of shell. A. adult, B. juvenile.

FAMILY ACTEOCINIDAE - Pilsbry, 1921

Fig. 37. *Acteocina* (*Retusa*) *canaliculata* (Say, 1822). Channeled *Barrel-bubble*. *Nova Scotia to Florida*, Texas and the West Indies. Length 3-6 mm, cylindrical, with moderately raised spire (may vary). White, glossy smooth with microscopic growth lines. Aperture elongate, outer lip thin, suture slightly channeled.

FAMILY HAMINOEIDAE - Pilsbry, 1895

Fig. 38. *Haminoea succinea* (Conrad, 1846). West Florida to Texas; Bermuda. *To 12 mm in length*. Oval shell, thin, fragile with spire concealed. Translucent white with small spiral grooves, sides of whorl nearly flat.

Fig. 39. *Haminoea antillarum* (Orbigny, 1941). Gulf of Mexico to Brazil; Bermuda. *To 13 mm* in length. Globose, fragile, spire concealed. Spiral striae fine, translucent greenish yellow.

ORDER NUDIBRANCHIA

FAMILY DOTOIDAE

Fig. 40. Unidentified sp. probably a juvenile of the family DOTOIDAE. 1.4 mm in length, rhinophores smooth, 6-7 smooth, simple cerata. Small black pigmentation spots covering body.

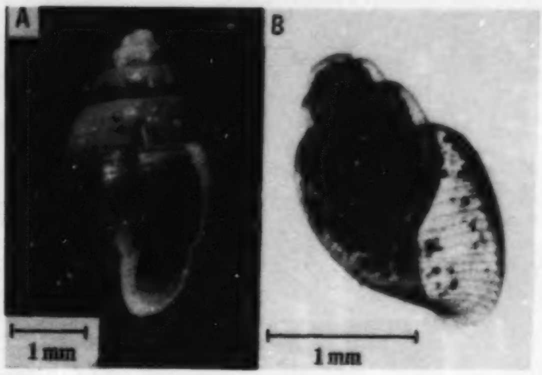
SUBCLASS PULMONATA

ORDER BASOMMATOPHORA

FAMILY MELAMPIDAE - Stimpson, 1851

Fig. 41. *Melampus coffeus* (Linne, 1750). Coffee Melampus. South half *of Florida, West Indies,* Brazil, Bermuda. To 20 mm in length. Conic, dark brown with lighter brown spiral lines. Outer lip thin, columella with 2 folds near bottom of aperture.

PLATE 7 (Figures 36-41)



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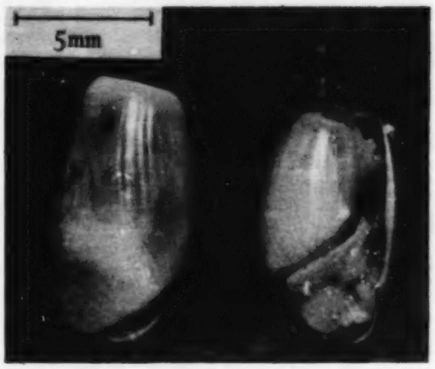

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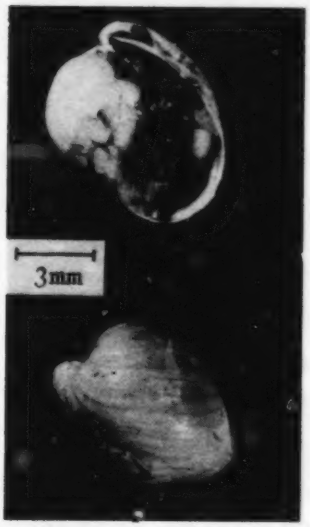

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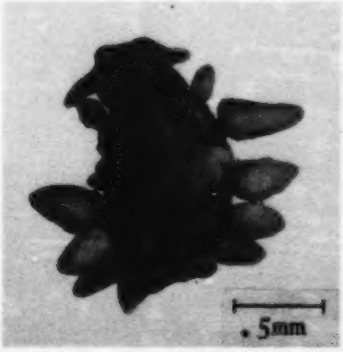

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CLASS BIVALVIA (Figures 42-79)

Definition: The bivalves lack a differentiated head and radula. The shell has two valves which are oriented laterally to the soft body and hinged dorsally. The valves are closed by 1-3 muscles attached to the inside of the valves.

Bivalves are normally found buried in (burrowing) or attached to the substrate, although some species may actively crawl about in a manner similar to the gastropods. At times certain species are very abundant numbering in the thousands per square meter. Size, shell shape and sculpture, hinge structure and muscle scars are important for identification, Figure 42.

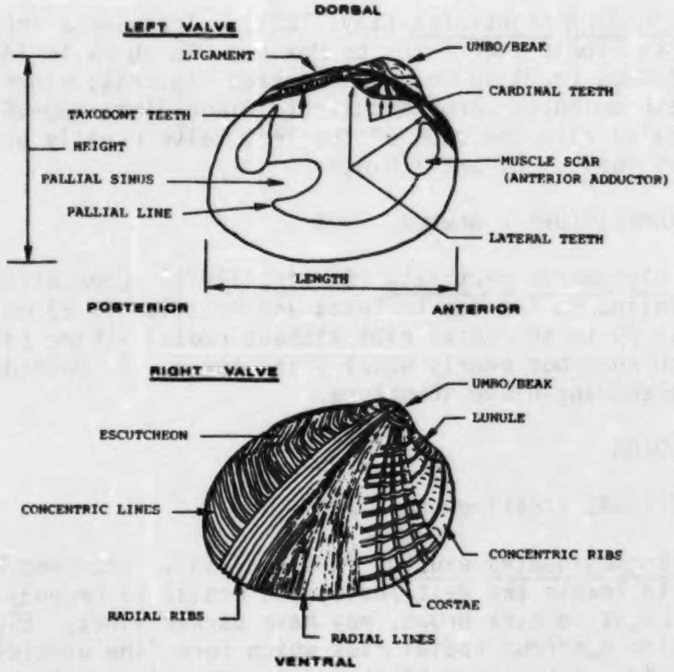

DORSAL
LEFT VALVE
LIGAMENT
UMBO/BEAK
CARDINAL TEETH
TAXODONT TEETH
HEIGHT
PALLIAL SINUS
PALLIAL LINE
MUSCLE SCAR
(ANTERIOR ADDUCTOR)
LATERAL TEETH
LENGTH
POSTERIOR
ANTERIOR
RIGHT VALVE
UMBO/BEAK
LUNULE
ESCUTCHEON
CONCENTRIC LINES
CONCENTRIC RIBS
COSTAE
RADIAL RIBS
RADIAL LINES
VENTRAL

Figure 42. Diagrammatic composite of a bivalve shell.

SUBCLASS PRIONODESMATA

ORDER PROTOBRANCHIA

FAMILY NUCULIDAE - Gray, 1824

Fig. 43. Nucula crenulata - A. Adams, 1856. Atlantic Crenulate Nut Clam. South Carolina to Florida; Texas and Brazil. To 64 mm in length, yellow-white, ovate. Ventral margin finely crenulate, numerous fine concentric lines. Hinge strong with many small teeth.

SUBCLASS PTERIOMORPHIA

ORDER ARCOIDA

FAMILY ARCIDAE - Lamarck, 1809

Fig. 44. Anadara transversa (Say, 1822). Transverse Ark. South of Cape Cod to Florida and Texas to Mexico. To 38 mm in length. Left valve overlaps right valve. Long narrow ligament; hinge with numerous small teeth oriented perpendicular to hinge line. 30-35 radial ribs on each valve with the ribs of the left valve usually beaded. A. Outside of shell. B. Shell hinge.

FAMILY GLYCMERIDIDAE - Newton, 1922

Fig. 45. Glycymeris pectinata (Gmelin, 1791). Comb Bittersweet. North Carolina to Florida to Texas and Brazil. To 23 mm in length. Grey, with 20 to 40 radial ribs without radial striae (lines). Strong hinge with numerous nearly equal sized teeth. A. Outside of valve. B. Inside showing hinge structure.

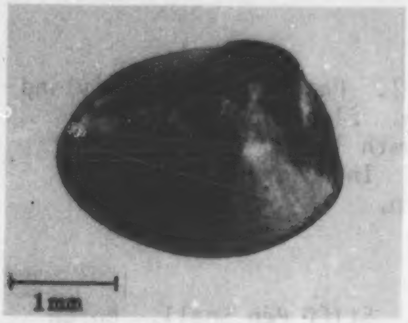
ORDER MYTILOIDA

FAMILY MYTILIDAE - Rafinesque, 1815

Fig. 46. Branchidontes exustus (Linne, 1758). Scorched Mussel. North Carolina to Texas; the West Indies and Brazil to Uruguay. To 38 mm in length. Light to dark brown, may have darker lines. Elongate, fan shaped, with numerous radial ribs which form fine denticles along shell margin. Interior metalic purple and white. Hinge with 1-4 small teeth anteriorly and 5-6 very small teeth posteriorly.

Fig. 47. Musculus lateralis (Say, 1822). Lateral Musculus. North Carolina to Florida to Texas; West Indies and Brazil. To 10 mm in length. Oblong, light brown often with blue green tinge, interior slightly iridescent. Fragile, with concentric lines and radial ribs with a portion lacking the radial ribs. No hinge teeth.

PLATE 8 (Figures 43-47)



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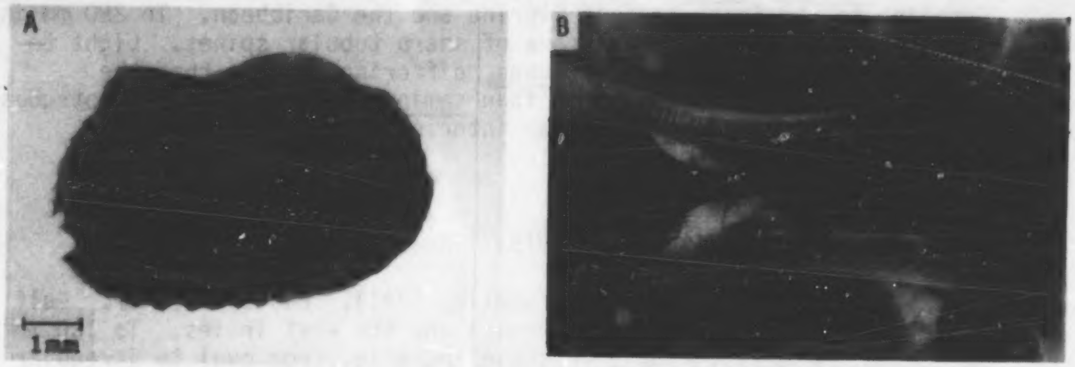

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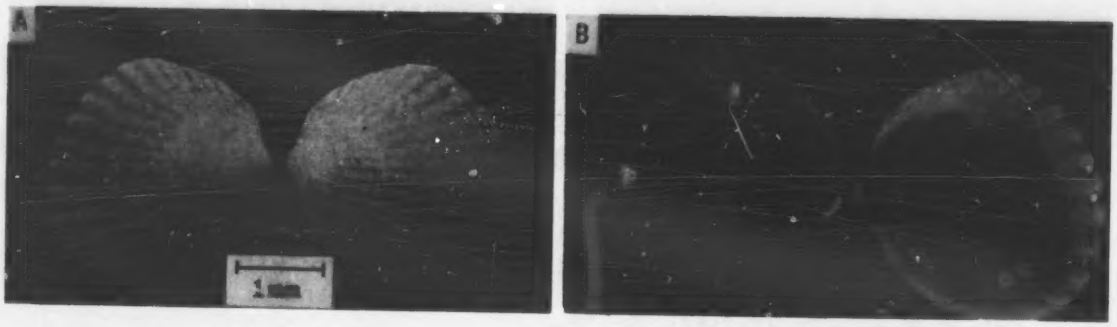

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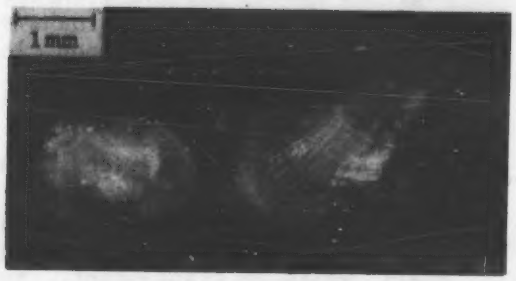

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Fig. 48. Amygdalum papyrium (Conrad, 1846). Paper Mussel. Maryland to Florida and Texas. To 38 mm in length. Elongate, fan shaped, smooth. Fragile with fine concentric growth lines. Grey or light brown and may have irregular brown lines. Interior, iridescent white. Thin weak ligament, no hinge teeth.

FAMILY PINNIDAE - Leach, 1819

Fig. 49. Atrina rigida (Lightfoot, 1786). Stiff Pen Shell. North Carolina to the South half of Florida and the Caribbean. To 280 mm in length, with 15 to 25 radial rows of sharp tubular spines. Light to dark brown. Similar to A. seminuda, differing only in that the posterior muscle scar is larger than seminuda and borders or protrudes above the nacreous section of the interior.

ORDER PTERIOIDA

FAMILY OSTREIDAE - Rafinesque, 1815

Fig. 50. Crassostrea virginica (Gmelin, 1791). Eastern Oyster. Gulf of St. Lawrence to the Gulf of Mexico and the West Indies. To 150 mm in length. Highly variable in shape and size, from oval to irregular elongate. Dull grey exterior, white inside with purple muscle scar. Surface rough, scale-like.

ORDER VENEROIDA

FAMILY LUCINIDAE - Vyalov, 1936

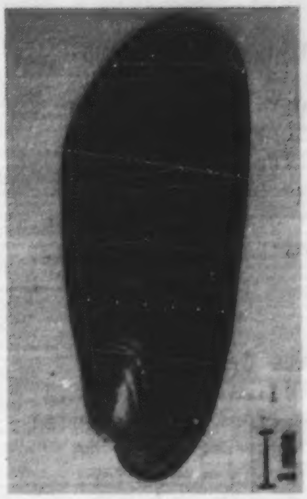
Fig. 51. Parvilucina multilineata (Tuomey and Holmes, 1957). Many-lined Lucina. North Carolina to Florida to Texas, Brazil. To 10 mm in length. White, circular, thick shell. Fine concentric lines, strongest at umbo, and thin radial lines also strongest at umbo. Small cardinal and lateral teeth; margins of valves with fine denticulations. A. External view. B. Inside of shell. Note hinge, muscle scars and pallial line.

Fig. 52. Lucina nassula (Conrad, 1846). Woven Lucina. North Carolina to Florida, Texas and the Bahamas. To 13 mm in length, circular, strong, chalk white. Strong closely spaced concentric and radial ribs which form a rough surface, and a small raised scale at the intersection of the ribs. 2 cardinals and 2 lateral teeth.

FAMILY CYRENOIDIDAE - H. and A. Adams, 1857

Fig. 53. Cyrenoida floridana (Dall, 1896). Florida Marsh Clam. Georgia to Florida. To 19 mm in length. Nearly round, thin, delicate shell, white or translucent. Surface smooth or with fine concentric growth lines. Hinge with 2 cardinal teeth. A. Valves, external view. B. Hinge structure.

PLATE 9 (Figures 48-53)



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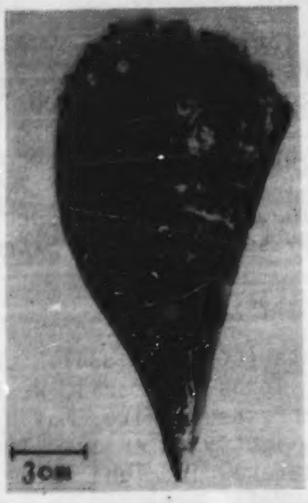

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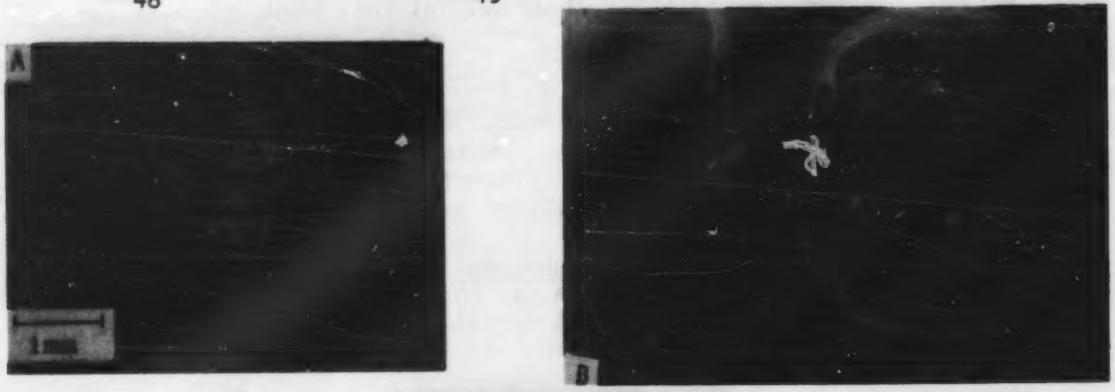

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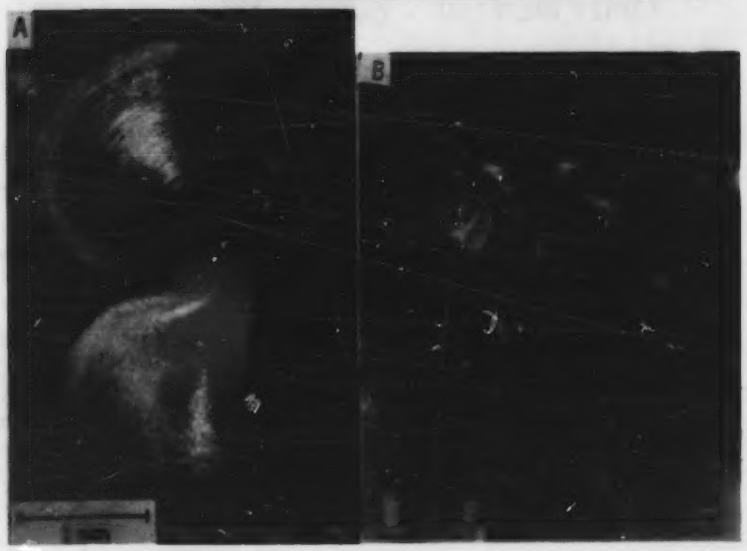


FAMILY LEPTONIDAE - Gray, 1847

Fig. 54. *Mysella planulata* (Stimpson, 1857). Altantic Flat Lepton. Nova Scotia to Texas and the West Indies. To 3 mm in length. Flattened, oblong oval, fragile. Anterior end longer. Smooth witn only fine concentric growth lines. Dorsal margin depressed both anteriorly and posteriorly of small pointed umbo. Translucent to white. A small central resilifer in the right valve bordered by 2 small teeth, one on each side. Note: This species often occurred in very high densities in muddy sediments. A. External view. B. Hinge.

FAMILY CRASSATELLIDAE - Ferussac, 1822.

Fig. 55. *Crassinella lunulata* (Conrad, 1834). Lunate Crassinella. Massachusetts to Florida to Texas to Brazil, West Indies. To 8 mm in length. Subtriangular, compressed, white, may have light brown radial rays. Beaks at middle or slightly anterior. Two cardinal teeth in each valve. One anterior lateral in right valve and one posterior lateral in the left valve. Well developed concentric ribs, worn to varying degrees. A. External view. B. Internal view.

FAMILY CARDIIDAE - Oken, 1818

Fig. 56. *Laevicardium mortoni* (Conrad, 1830). Morton's Egg Cockle. Cape Cod to Florida to Texas, West Indies. To 25 mm in length. Ovate, glossy, inflated, strong. Cream color with brown, concentric zigzag markings. Cardinal and lateral teeth present.

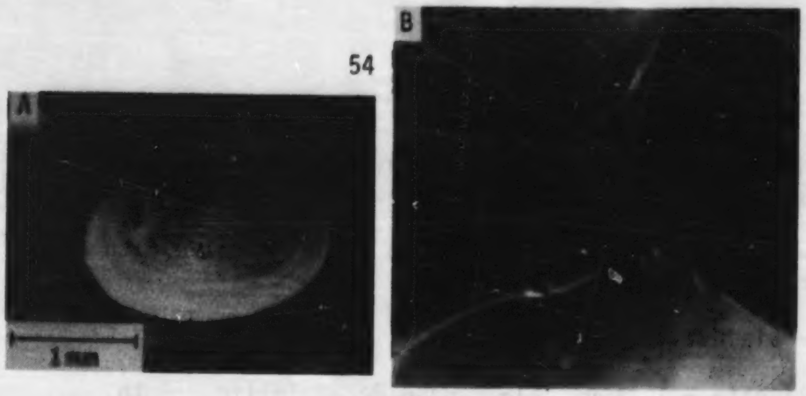
Fig. 57. *Dinocardium robustum vanhyningi* - Clench and L.C. Smith, 1944. Vanhyning's Cockle. Tampa Bay to Cape Sable, Florida. To 127 mm height. 32-36, smooth rounded radial ribs. Yellow with patches and bands of red to purplish brown. With cardinal and lateral teeth.

FAMILY MACTRIDAE - Lamarck, 1809

Fig. 58. *Mactra fragilis* - Gmelin, 1791. Fragile Atlantic Mactra. North Carolina to Florida, Texas and the West Indies. To 63 mm in length. Oval, moderately thin, smooth, white, with fine concentric growth lines. Umbones rounded, nearly central. Two ligaments, one exterior, one interior, and a bifid cardinal tooth. Prominent escutcheon with one ridge along dorsal margin. Fairly large posterior gape. A. External view. B. Live specimen. C. Hinge structure.

Fig. 59. *Mulinia lateralis* (Say, 1822). Dwarf Surf Clam. Maine to Florida to Texas and Mexico. To 12 mm in length. Subtriangular, moderately obese, prominent beaks nearly central. White to creme color, smooth with concentric growth lines. Esscutcheon delineated by a posterior radial ridge. Hinge with bifid cardinals and lateral teeth.

PLATE 10 (Figures 54-59)



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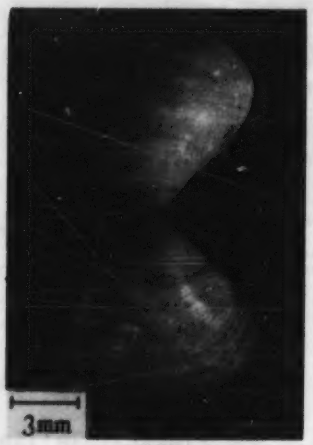

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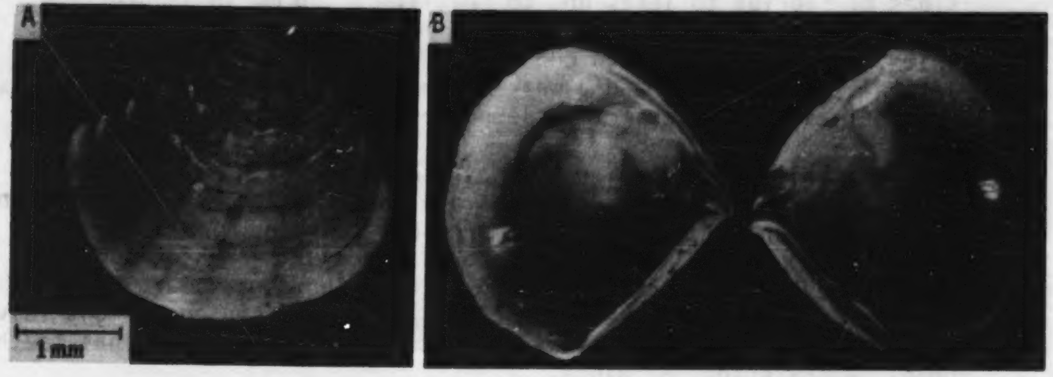

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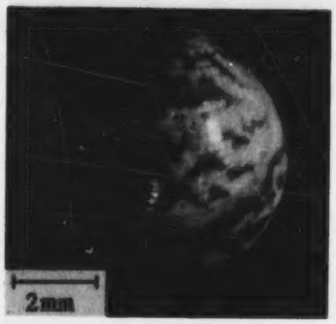

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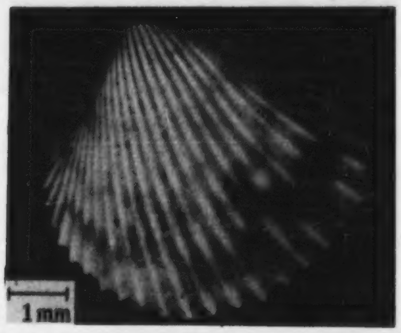

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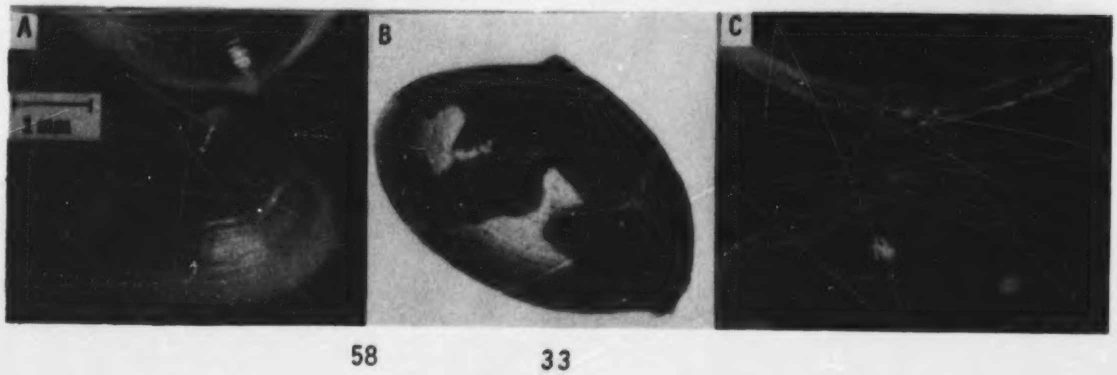

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FAMILY SOLENIDAE - Lamarck, 1809

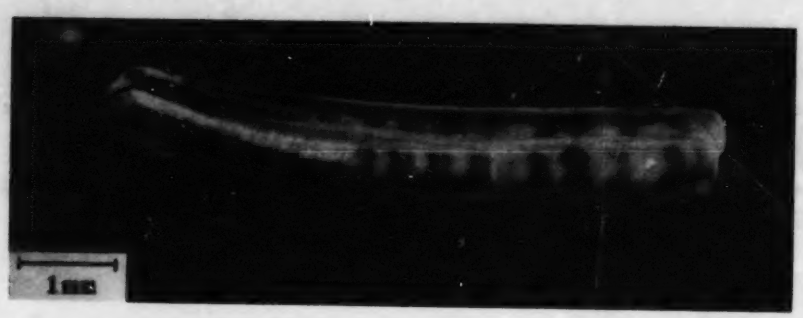
Fig. 60. *Ensis minor* - Dall, 1900. Minor Jacknife Clam. New Jersey to Florida to Texas. To 76 mm in length. Long, narrow, fragile. White, with purplish stains anteriorly, may also be visible on exterior. Hinge with 2 vertical cardinal teeth and each valve with a long low posterior tooth.

FAMILY TELLINIDAE - Blainville, 1814

Fig. 61. *Tellina lineata* - Turton, 1819. Rose Petal Tellin. Both sides of Florida to Texas and to Brazil. To 38 mm in length. Elongate; valves twist to the right, left valve slightly inflated. White, smooth glossy, with concentric growth lines. Cardinal and lateral teeth present and a weak interior rib radiating from umbones to just past the anterior muscle scar. A. Exterior. B. Hinge.

Fig. 62. *Tellina versicolor* - DeKay, 1843. Dekay's Dwarf Tellin. Rhode Island to Key West; to Texas and the West Indies. To 17 mm in length. Moderately elongate, compressed, fragile. Translucent, glossy white, may have white, red or pink rays. Anterior dorsal margin elongate, slightly inclined. Posterior dorsal margin short, steeply inclined. Umbones slightly posterior of center. Right valve with cardinal teeth and lateral teeth left valve with cardinal teeth only. A. Exterior, B. Hinge.

PLATE 11 (Figures 60-62)



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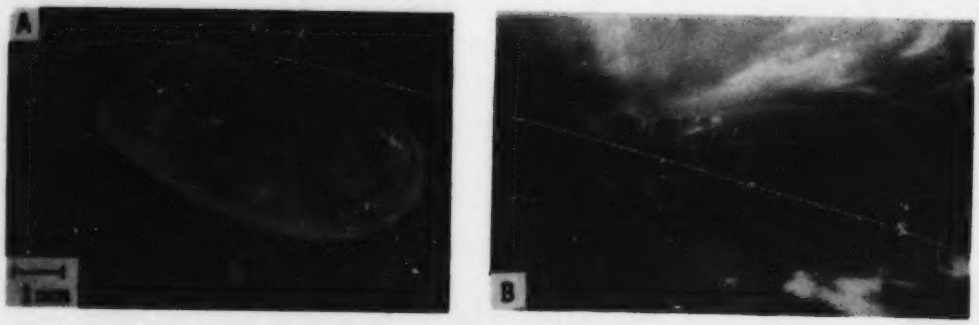

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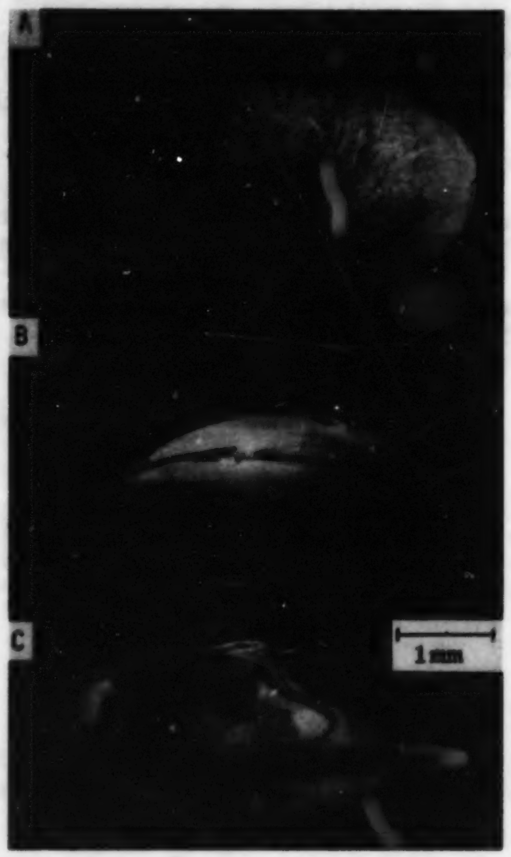
Fig. 63. *Macoma tenta* (Say, 1834). Tenta Macoma. Cape Cod to Florida to Brazil, the West Indies. To 19 mm in length. White, elongate, fragile, may have slight iridescence on exterior. Narrower, posterior, end flexed to the left. Two cardinal teeth in left valve, one in right, no lateral teeth. A. Lateral view. B. Dorsal view. C. Live specimen.

FAMILY SEMELIDAE - Stoliczka, 1870

Fig. 64. *Semele purpurascens* (Gmelin, 1791). Purplish Semele. North Carolina to Florida to Texas; West Indies and Brazil. To 38 mm in length. Oblong, thin smooth shell, with fine concentric growth lines. Color grey to cream, may have purplish or orange mottlings. Resilium in a horizontal depression parallel with hinge line. Two cardinal teeth in each valve. Two lateral teeth in right valve, but reduced in left valve. External ligament.

Fig. 65. *Abra aequalis* (Say, 1822). Common Atlantic Abra. North Carolina to Texas and the West Indies. Brazil. To 12 mm in length. Orbicular, white, smooth, glossy, inflated. Anterior margin of right valve grooved. Right valve with two cardinal teeth, one anterior lateral. Left valve without laterals. Elongate chondrophore supporting resilium. A. Exterior. B. Hinge.

PLATE 12 (Figures 63-65)



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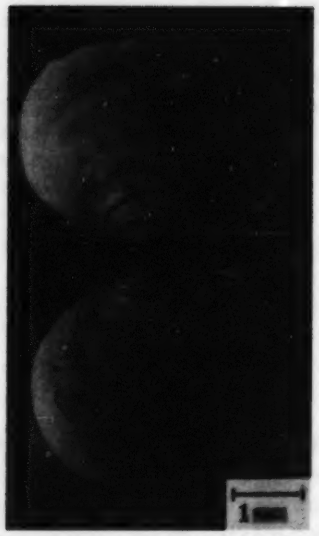

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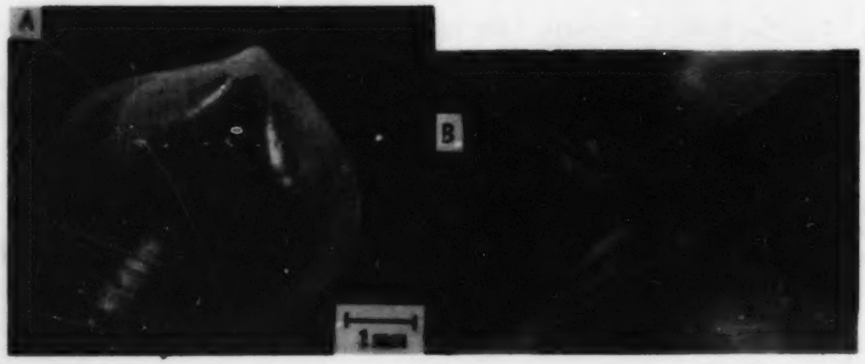

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FAMILY SOLECURTIDAE - Orbigny, 1846

Fig. 66. *Tagelus divisus* (Spengler, 1794). Purplish Tagelus. Cape Cod to Florida, Gulf States to Brazil. Bermuda. To 38 mm in length. Elongate, flattened cylindrical, smooth, fragile. Gaping at both ends, beaks near the middle. No lateral teeth, 2 small cardinal teeth in the right valve, 1 in the left valve. A weak internal radial rib sometimes visible. Whitish purple, with purple radial rays.

Fig. 67. *Tagelus plebius* (Lightfoot, 1786). Stout Tagelus. Cape Cod to Florida and the Gulf states; the West Indies and Brazil. To 89 mm in length. Elongate, smooth, adults rather rectangular. Umbones small, posterior of center. Hinge with 2 small cardinal teeth with a bulbous callus behind them. Sculptures with faint concentric growth lines. Brown to greenish brown color.

FAMILY DREISSENIDAE - Gray, 1840

Fig. 68. *Mytilopsis leucophaeata* (Conrad, 1831). Conrad's False Mussel. New York to Florida to Texas and Mexico. To 19 mm in length. Mussel-like shape, rough exterior. Narrow, pointed beak, with a septum internally to which the anterior adductor is attached. A long thin bar under the ligament.

FAMILY VENERIDAE - Rafinesque, 1815

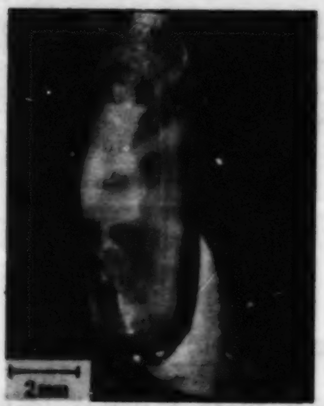
Fig. 69. *Mercenaria compechiensis* (Gmelin, 1791). Southern Quahog. Southern New Jersey to Florida to Texas and Cuba. To 152 mm in length. Ovate trigonal, heavy, grey to white color. Teeth strong, 3 cardinals in each valve. Sculpture of strong concentric growth lines.

Fig. 70. *Macrocallista nimbosa* (Lightfoot, 1786). Sunray Venus. North Carolina to Florida to Texas. To 127 mm in length. Elongate, oval, compressed, glossy smooth with a thin brown periostracum, with brownish radial rays. Three cardinal teeth with long external ligament.

Fig. 71. *Cyclinella tenuis* (Recluz, 1852). Atlantic Cyclinella. Virginia to Texas; West Indies and Brazil. To 50 mm in length. Circular, compressed, dull white with fine concentric growth lines. Three cardinal teeth but no laterals. Similar to *Dosinia*. A. Outside view. B. Hinge area.

Fig. 72. *Dosinia discus* (Reeve, 1850). Disk Dosinia. Virginia to Florida, Gulf states, Mexico and Bahamas. To 76 mm in length. Circular, compressed, with numerous fine concentric ridges. White, three cardinal teeth in each valve.

PLATE 13 (Figures 66-72)



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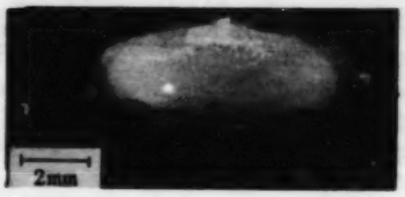

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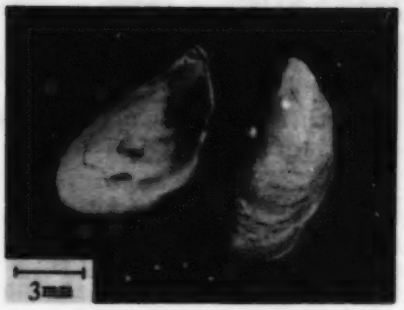

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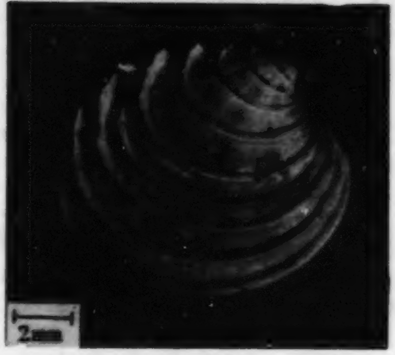

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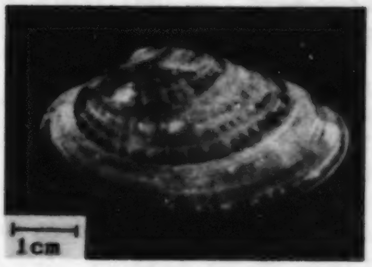

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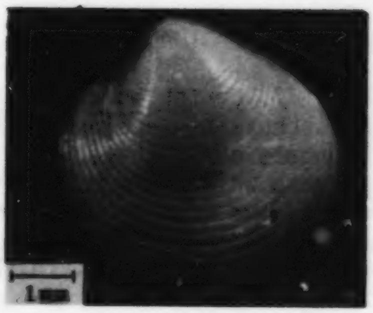

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Fig. 73. *Parastarte triquetra* (Conrad, 1846). Brown Gem Clam. Both sides of Florida. To 3 mm in length. Higher than long, large elevated umbones. Tan to brown, smooth glossy. Right valve with 2 strong cardinals, left with 1 cardinal 2 small laterals. Small pits along interior ventral margins. A. Lateral view. B. Inside, shell hinge.

ORDER MYOIDA

FAMILY MYIDAE - Lamarck, 1809

Fig. 74. *Sphenia antillensis* - Dall and Simpton, 1901. Antellean Sphenia. West Florida, Texas, Puerto Rico, Brazil. To 6 mm in length. Thin, fragile, irregular shape, right valve slightly larger than left. Dull white with concentric growth lines.

FAMILY CORBULIDAE - Lamarck, 1818

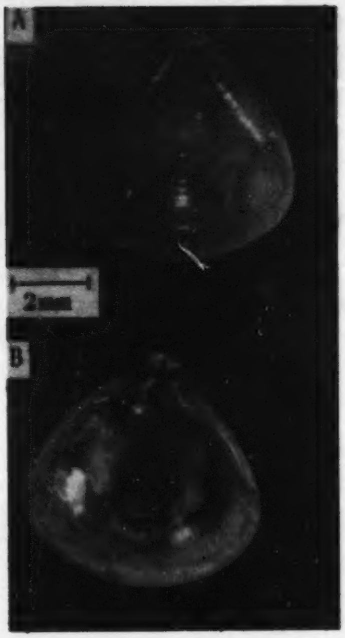
Fig. 75. *Corbula contracta* - Say, 1822. Contracted Corbula. Cape Cod to Florida, Texas, West Indies and Brazil. To 9 mm in length. Trigonal, grey to white, valves inequal with posterior ventral margin of right valve overlapping left valve. Thick shell with irregular concentric growth ridges. Prominent posterior radial ridge. A prominent cardinal tooth in the right valve which fits into a V-shaped notch in the left valve. Probably synonymous with *C. caribaea*.

Fig. 76. *Corbula swiftiana* - C.B. Adams, 1852. Swift's Corbula. Massachusetts to Florida, Texas and the West Indies. To 9 mm in length. Trigonal, white right valve much larger, more obese and overlapping the left valve along ventral posterior margin. Posterior slope with 2 radial ridges on the right valve, one on the left valve. Concentric growth ridges on both valves. Prominent cardinal tooth in right valve, fitting into V-shaped notch in left valve. Similar to *C. contracta*, however, valves are more in-equal than *contracta* and the posterior muscle of *swiftiana* is attached on a raised platform. A. Exterior. B. Interior.

FAMILY PHOLADIDAE - Lamarck, 1809

Fig. 77. *Cyrtopleura costata* (Linne, 1758). Angel Wing. Massachusetts to Florida, to Texas to Brazil. To 180 mm in length. Elongate oval, white, fragile. About 30 radial ribs and concentric ridges, white form beads of scales at their intersections. Protoplax triangular (chitinous). Mesoplax butterfly shaped (calcareous). Long united siphons which cannot be withdrawn into shell by adults. Shell gaping along margins. A. Lateral view. B. Ventral view.

PLATE 14 (Figures 73-77)



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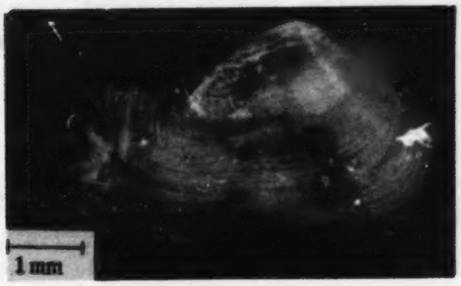

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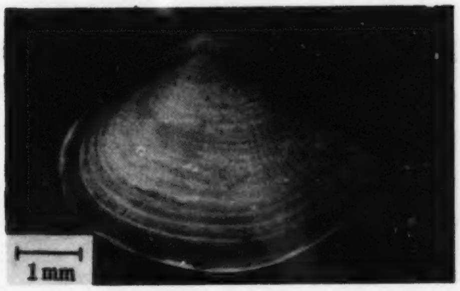

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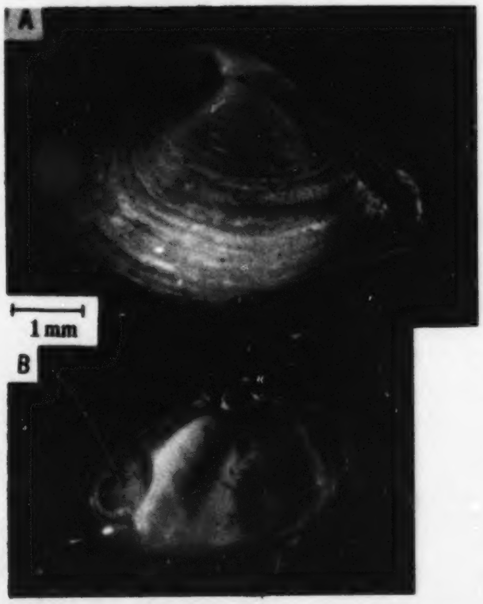

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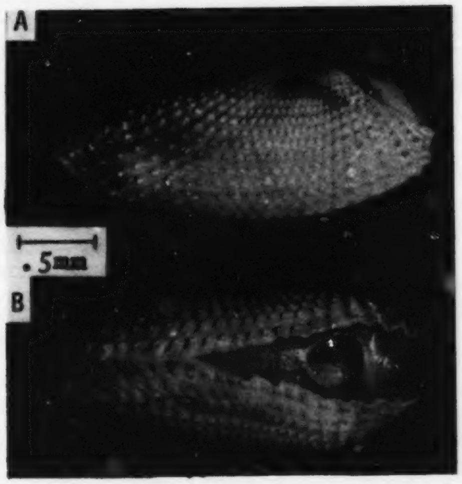

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ORDER EUDESMONDONTIDA

FAMILY LYONSIIDAE - Fisher, 1887

Fig. 78. *Lyonsia hyalina floridana* - Conrad, 1849. Florida Lyonsia. West coast of Florida to Texas. To 16 mm in length. Elongate, fragile, valves inequal. White, translucent, sculpted with fine growth lines and raised radial lines. No teeth in hinge. Commonly sheathed with sand grains.

FAMILY PERIPLOMATIDAE - Dall, 1895

Fig. 79. *Periploma margaritaceum* (Lamarck, 1801). Unequal Spoon Clam. South Carolina to Florida to Texas. To 25 mm in length. Oblong, fragile, left valve more inflated and overlapping the right valve. White, with fine concentric growth lines. Umbones close together, each with a short radial groove in the surface. Hinge with a large spoon shaped tooth.

PLATE 15 (Figures 78-79)

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SECTION 6

PHYLUM ANNELIDA

Definition: The annelids are segmented coelomate worms. The body consists of a longitudinal series of metameres or segments. Segmentation is usually complete; it may be secondarily modified; the muscles, coelom and peritoneum being arranged in segments. The nervous, circulatory, excretory, and reproductive systems are all metameric in structure. The mouth is usually located between the anterior most presegment, the prostomium; and the first counted segment, the peristomium, it may appear to be several segments posterior to this. New segments usually are formed just before the terminal segment or pygidium, which also contains the anus.

The Annelida are composed of three classes: the Polychaeta, Oligochaeta, and the Hirudinea. The polychaetes are the most numerous of the three classes followed by the oligochaetes. The oligochaetes and the Hirudinea or leeches are primarily terrestrial and freshwater. There were no benthic leeches recovered from the study area and relatively few species of oligochaetes.

CLASS POLYCHAETA (Figures 82-119)

Definition: Multi-segmented, primarily marine or estuarine annelids with parapodia bearing numerous setae; usually bearing anterior appendages, such as antennae, palps or tentacular cirri; they are dioecious with simple exit ducts from the gonads.

The polychaetes are a very diverse group for which a single definition cannot be all-inclusive. For any particular polychaete, all of the definition characteristics need not be present. However, the definition is sufficient for most of the major polychaete groups. A major problem in the classification of the polychaetes has been the arrangement of the families into orders. Traditionally, they have been separated into two large somewhat artificial orders, the Errantia and the Sedentaria. The errant polychaetes are generally rapacious, and free-living. They usually have a large number of equal segments, with the anterior appendages modified into palps, antennae and tentacular cirri. All polychaetes with jaws are included in this order. The Sedentaria generally have a limited number of body segments separated into distinct regions. They are tube dwellers or burrowers being deposit or filter feeders. They have short parapodia, and anterior appendages may be absent or present with few too many similar structures.

These orders, although not completely satisfactory, separate the polychaetes into two nearly equal groupings in terms or number of families and number of species. Recently, new schemes have been proposed in attempts to subdivide the families in a more phylogenetic manner. Few of these schemes have gained widespread acceptance, largely because they do not solve the classificatory problems more suitably than the old scheme. Fauchald (1977) proposed a scheme based on phylogenetic ideas; defining orders using major anatomical and morphological features, and this is becoming widely accepted. Since the polychaetes are poorly represented in the fossil record, phylogenethic relationships can only be inferred by comparisons of living species and their developmental similarities.

The purpose of this manual is not to debate or propose classification schemes. Therefore, definitions and organizations above the family level are not considered other than the traditional separation of Errantia and Sedentaria.

Polychaetes are extremely abundant, being found in virtually every marine habitat type. They are usually the numerically dominant macrofaunal organism of estuarine soft-bottom communities. Size varies greatly from a few millimeters to many centimeters. Many anatomical and morphological features are important for identification of polycheates. Figure 80 shows a stylized composite polychaete, showing many of the features important for identification. The number, type and arrangement of setae are also taxonomically important. Figure 81 exhibits a few of the many types of setae.

Polychaetes are the major faunal component of the Tampa Bay system. Samples collected during the course of the study were nearly always dominated by polychaetes, both in numbers of species and overall densities. The polychaetes depicted here represent some of the most common and abundant species from the study area.

ORDER PHYLLODOCIDA
FAMILY POLYNOIDAE - Malmgren, 1867 (Figure 82)

Definition: Dorsoventrally flattened bodies; 1-3 pairs of antennae, pharynx eversible, with four jaws; setae simple, notosetae variously developed and usually in lateral position. On anterior end, dorsal cirri alternate with marginally smooth or fringed elytrae.

FAMILY SIGALIONIDAE - Malmgren, 1867 (Figure 83)

Definition: Flattened or quadrangular body; 1-3 antennae; four jaws. Marginally fringed elytrae alternative with dorsal cirri anteriorly; elytrae on all posterior setigers.

FAMILY CHRYSOPETALIDAE (Figure 84)

Definition: Short flattened bodies; one antenna. Notosetae in rosetts on notopodial tubercles; composite neurosetae.

FAMILY PHYLLODOCIDAE - Williams, 1851 (Figure 85-89)

Definition: With long slender body; 4-5 antennae on prostomium; eyes small, when present; 2-4 pairs of tentacular cirri; parapodia uniramous or bioramous; notopodia a short stalk with large, foliose dorsal cirri, or rarely with acicula or setae; neurosetae composite; notosetae simple, when present.

FAMILY HESIONIDAE - Sars, 1862 (Figures 90-91)

Definition: Dorsoventrally flattened, short bodied; 2-3 antennae; palps absent or with one to three articles; 2-8 pairs of tentacular cirri; jaws present or absent; parapodia uniramous or bioramous, notopodia reduced in comparison to neuropodia; long slender dorsal cirri; neurosetae composite; notosetae simple or absent.

FAMILY PILARGIIDAE - Saint Joseph, 1899 (Figures 92-93)

Definition: Body generally cylindrical or flattened and ribbon-like. Prostomium usually small, inconspicuous, with 2 or 3 antennae (rarely absent). Palps present being simple or biarticulated. Two pairs of tentacular cirri or rarely one or none. Parapodia are biramous with reduced notopodia. All seta are simple. Notosetae may be absent or present as a thick spine or hook. Proboscis unarmed.

FAMILY SYLLIDAE - Grube, 1850 (Figures 94-96)

Definition: Small to medium sized, usually slender; may be dorsoventrally flattened; three antennae and simple palps which may be fused; two pairs of tentacular cirri; eversible pharynx armed with teeth or unarmed; proventricle nearly always present; uniramous parapodia; dorsal cirri usually conspicuous; setae simple or composite.

FAMILY NEREIDIDAE - Johnston, 1845 (Figures 97-99)

Definition: Body elongate, cylindrical; prostomium distinct, soboval to subpyriform; four eyes (rarely absent); two (rarely one) antennae; two biarticulated palps; first segment usually without podia and setae; 2-4 pairs of tentacular cirri; protrusible pharynx with a pair of jaws and often denticles or papillae; parapodia usually biramous, with flattened lobes and cirri; composite or simple setae, falcigers or spinigers.

FAMILY NEPHTYIDAE - Grube, 1850 (Figures 99-100)

Definition: Long slender bodies, quadrangular in cross-section, numerous short segments; prostomium small, angulate; two pairs of antennae; one pair of short palps; one pair of lateral jaws; biramous parapodia, rami well developed, with complex presetal and postsetal lobes; setae simple; interramal, respiratory cirri nearly always present.

FAMILY GLYCERIDAE - Grube 1850 (Figures 101-102)

Definition: Body long, round, smooth tapering gradually at both ends; prostomium concical, annulated with 4 small, usually biarticulate antennae; eversible proboscis with four jaws in a cross; parapodia all biramous or uniramous; neurosetae composite, notosetae simple or absent.

FAMILY GONIADIDAE - Kinberg, 1866b (Figure 103)

Definition: Long slender body with a conical prostomium. Protrusable proboscis with small and larger jaw-pieces. Parapodia uniramous anteriorly, biramous posteriorly or rarely all uniramous. Neurosetae composite, notosetae simple.

ORDER SPIONIDA

FAMILY EUNICIDAE - Savigny, 1818 (Figures 104-105)

Definition: Elongate, cylindrical body slightly flattened, tapered posteriorly; prostomium with 1-5 occipital antennae; maxillary carriers short, third carrier absent; maxilla I smooth, curved; notopodia consist of branchiae and dorsal cirri; setal types; composite falcigers and spinigers, limbate, pectinate and subacicular hooks.

FAMILY ONUPHIDAE - Kinberg, 1865 (Figures 106-107)

Definition: Modified for a tubicolous mode of life; elongate, veriform, numerous similar segments; two ventral palps, two frontal and five occipital antennae; with or without eyes; maxillary carriers short, third carrier absent; branchiae simple or absent; Neuropodia presented by base of branchia and the dorsal cirri, may contain an internal acicula; setae of various types.

FAMILY LUMBRINERIDAE - Malmgren, 1867 (Figure 108)

Definition: Body elongate, cylindrical, tapering anteriorly and posteriorly; without prostomial appendages, occasionally with 1-3 nuchal papillae; maxillary carriers short, third carrier absent; usually lacking eyespots; notopodia absent or as small projections sometimes with internal acicula; dorsal and ventral cirri lacking, may have four short anal cirri; with or without parapodial branchiae. Setae include limbate setae, simple and composite hooks.

FAMILY SPIONIDAE - Grube, 1850 (Figures 109-113)

Definition: Usually small, body long; prostomium anteriorly blunt or pointed, may have an occipital papillae; extensible palps at the corners of the prostomium; parapodia biramous, lobes cirriform or foliose; setae simple, may be capillary, bi- or multi-dentate, hooded or non-hooded hooks.

FAMILY CHAETOPTERIDAE - Malmgren, 1867 (Figures 114-115)

Definition: Body consisting of 2-3 distinct regions. Peristomium with one or two pairs of tentacular cirri. Palps present, of varying lengths. Anterior region with uniramous parapodia, median and posterior regions have biramous parapodia. Setae of various types; capillary, limbate and modified spines on setiger 4. Posterior setigers contain pectiniform uncini.

ORDER ORBINIIDA

FAMILY ORBINIIDAE - Hartman, 1942 (Figures 116-117)

Definition: A long posteriorly tapering body; prostomium and peristomium without appendages; with lateral parapodia in thoracic region which are shifted dorsally in abdominal segments; setae are simple and include capillaries, simple hooks and occasionally are brush-topped bifid or furcate.

ORDER CAPITELLIDA

FAMILY OPHELIIDAE - Malmgren, 1867 (Figures 118)

Definition: Prostomium lacking appendages; palps absent. May have one anterior asetigerous segment. Parapodia usually biramous, may be uniramous; with small parapodial lobes. They have capillary setae which are smooth or marginally dentate.

ORDER TEREBELLIDA

FAMILY TEREBELLIDAE (Figure 119)

Definition: Body composed of two regions. Anterior region has biramous parapodia; posterior region with neuropodia only. Branchia absent or present with one to three pairs on the first segments. Prostomium without appendages. Uncini present usually with a large main fang and a crest of small teeth.

CLASS OLIGOCHAETA (Figure 120)

Definition: The Oligochaeta display a strong external metamerism, lack parapodia and cephalic appendages. The head is reduced and setae are absent from the prostomium and peristomium. Setae are presently either singularly or in bundles. They are hermaphorditic.

Most people are familiar with the Oligochaete in the form of the common earthworm. Marine species are usually somewhat smaller than the terrestrial or freshwater species. There is little external differentiation. There are usually two dorso-lateral and two ventro-lateral bundles of setae on each segment. The numbers and types of setae and the arrangement and structural detail of the reproduction apparatus are of primary taxonomic importance.

The marine oligochaetes of North America have not been adequately addressed in the past, (See Brinkhurst and Jamieson, 1971). However, there is currently very little information concerning the number and distribution of Gulf Coast oligochaetes. Current sutdies of the taxonomy and distribution of the marine Oligochaeta of the Gulf Coast should substantially increase the knowledge of this area.

A preliminary examination of some oligochaetes from Tampa Bay by Dr. M. S. Loden has yielded the following ta[illegible] list:

ORDER HAPLOTAXIDA
FAMILY TUBIFICIDAE

Akedrilus monospermathecus	Knoller, 1935
Limnodriloides winckelmanni	Michaelsen, 1914
Limnodriloides sp.	
Tubificoides c.f. *wasselli*	
Tubificoides sp.	

CLASS POLYCHAETA

Fig. 80. Composite polychaete depicting major anatomical features. A. Overall body plan. B. Anterior view of a single parapodium. a, antenna; a.c., anal cirrus; b. branchia; d. denticle; d.c., dorsal cirrus; e, eye; n, neuropodia; not., notopodia; p, palp; pa., parapodium; pap., papillae; p.c., peristomial cirri; pr., proboscis; s, setae; st., setiger (body segment); v.c., ventral cirrus.

Fig. 81. A few examples of the many types of polychaete setae: a, capillary; b, simple spiniger; c, compound spiniger; d, limbate; e, crochets (hooks); f, hooded; g, aristate; h, denticulate; i, lanceolate; j, bifid; k, bilimbate; l, falciger; m, harpoon; n, pinnate; o, pulmose.

ORDER PHYLODOCIDA

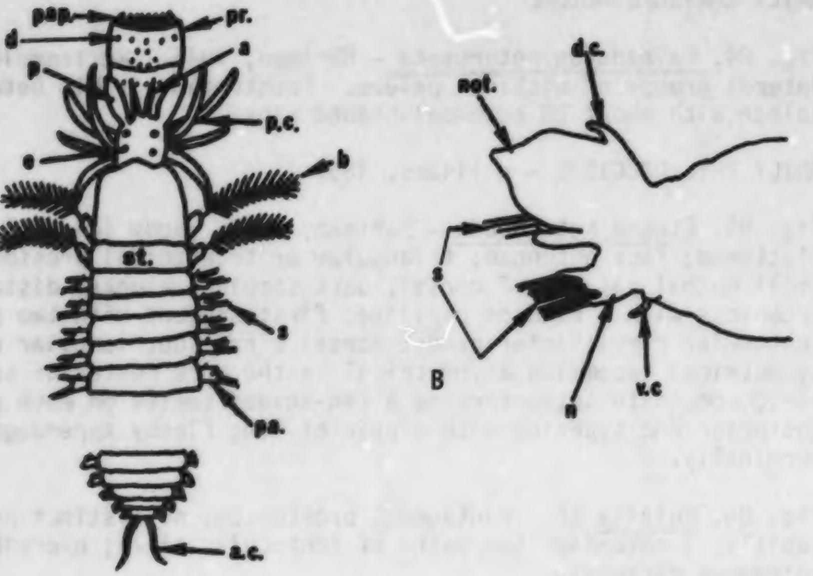
FAMILY POLYNOIDAE - Malmgren, 1867

Fig. 82. Harmothoe sp.

FAMILY SIGALIONIDAE - Malmgren, 1867

Fig. 83. Stenelais boa - Johnson, 1833. Cosmopolitan in temperate and tropical waters. To 200 mm in length, width (including setae) to 5 mm. Elytra subreniform or broadly lunate, and a deep emargination in center of anterior border. Surface of a few anterior elytra covered with simple papillae, posterior elytra with papillae on anterior and lateral margins. Median antenna present, with a short ceratophore; lateral antennae indistinct fused to base of tentacular segment. Compound neurosetae falcigerous with simple or multiarticulate blades ending in bidentate tips. Eyes present.

PLATE 16 (Figures 80-83)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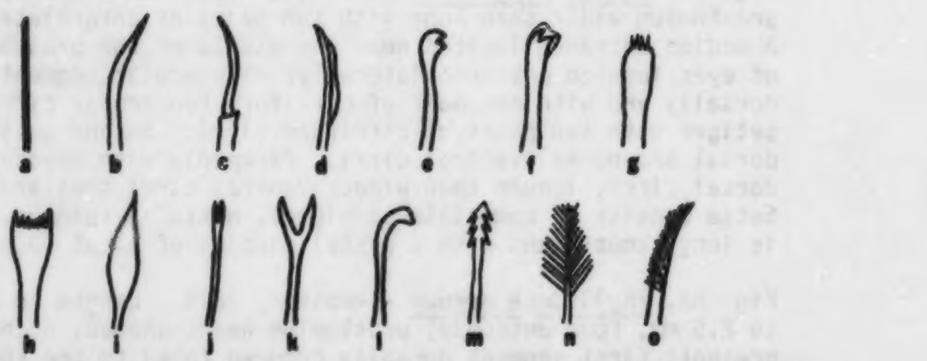
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FAMILY CHRYSOPETALIDAE

Fig. 84. *Paleanotus heteroseta* - Hartman, 1945. Rectangular body with lateral groups of distinct paleae. Prostomium visible between palea; paleae with about 20 subequal beaded ribs.

FAMILY PHYLLODOCIDAE - Williams, 1851

Fig. 85. *Eteone heteropoda* - Hartman, 1951. Body long, slightly flattened; four antennae; triangular or trapezoidal prostomium; a small nuchal papilla; 2 dorsal, dark simple eyespots; distal end of proboscis with a righ on papillae; first segment with two pairs of tentacular cirri; anteriormost dorsal cirri subtriangular nearly symmetrical becomming asymmetrical on the more posterior segments; 18-25 composite setae forming a fan-shaped series on each parapodium; posterior end tapering with a pair of long fleshy appendages terminally.

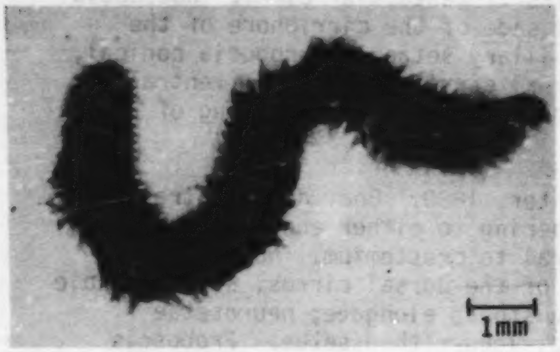
Fig. 86. *Eulalia* sp. Pentagonal prostomium, no distinct nuchal papilla; 5 antennae; two pairs of tentacular cirri; eversible pharynx, uniramous parapodia.

Fig. 87. *Eumida sanguinea* - Oersted, 1843. Body short, thick, prostomium wider than long with two pairs of anterolateral antennae. A median antennae located near the middle of the prostomium. One pair of eyes located posteriorlaterally. Tentacular segment reduced dorsally and with one pair of cirriform tentacular cirri. First setiger with two pairs of cirriform cirri. Second setiger with long dorsal and normal ventral cirri. Parapodia with broad foliaceous dorsal cirri, longer than wide. Ventral cirri similar but smaller. Setae consist of composite spinigers, distally spinous. The proboscis is long, smooth and with a distal circlet of about 20 papillae.

Fig. 88. *Phyllodoce arenae* - Webster, 1879. Length to 100 mm, width to 2.5 mm, four antennae; prostomium heart-shaped; nuchal papilla present; first segment dorsally reduced fused to the second; four pairs of long cylindrical tentacular cirri; base of proboscis covered with conical papillae; except for a narrow middorsal area.

Fig. 89. *Phyllodoce fragilis* - Webster, 1797. Body long, slender tapering to a small heart-shaped prostomium, with 2 large circular eyes, and a slender tail; dorsal cirri thick cordiform in outline; anterior cirri same as those farther back; ventral cirri also thick, shorter than their respective setigerous lobe except in young specimens where the ventral cirri are larger.

PLATE 17 (Figures 84-89)



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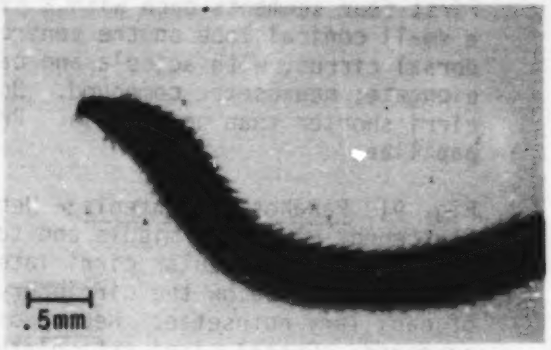

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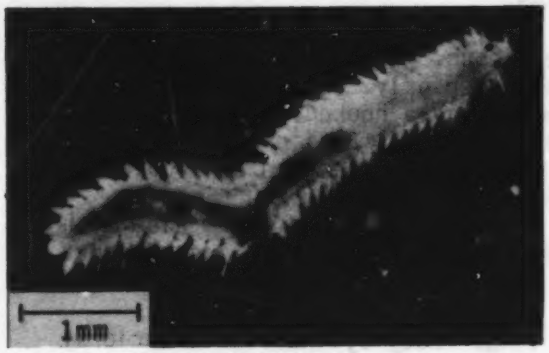

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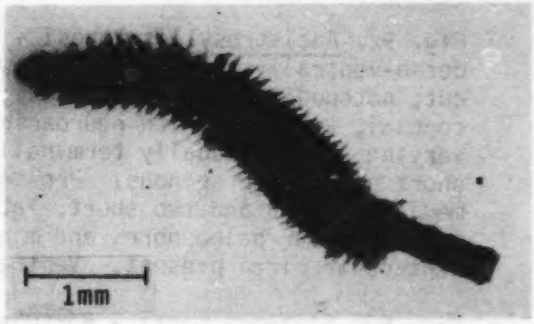

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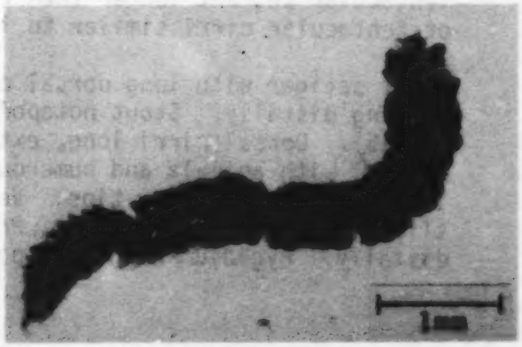

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FAMILY HESIONIDAE - Sars, 1862

Fig. 90. *Gyptis vittata* - Webster and Benedict, 1887. Body convex dorsally, flattened ventrally, widest in midregion tapering anteriorly and posteriorly. First tentacular segment not visible dorsally. First four segments each with 2 pairs of tentacular cirri. Notopodia a small conical lobe on the ventral side of the cirriphore of the dorsal cirrus, with acicula and capillary setae. Neuropodia conical, elongate; neurosetae compound. Dorsal cirri articulated, ventral cirri shorter than neuropodia. Proboscis with a distal ring of papillae.

Fig. 91. *Parahesione luteola* - Webster, 1880. Body dorsoventrally flattened, widest in middle and tapering to either end. Six pairs of long slender tentacular cirri lateral to prostomium. Notopodia a stout papilla below the cirriphore of the dorsal cirrus, with a bundle of capillary notosetae. Neuropodia stout, elongate; neurosetae compound. Dorsal cirri articulated, longer than setae. Proboscis with a large basal portion and a narrow distal portion with small papillae around opening.

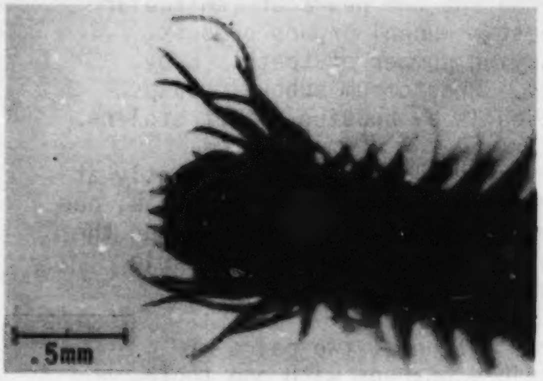
FAMILY PILARGIIDAE - Saint Joseph, 1899

Fig. 92. *Ancistrosyllis jonesi* - Pettibone, 1966. Body is long and dorso-ventrally flattened, narrowing anteriorly. Parapodia deeply cut; notopodia enlarged, conical; notoacicula hooked. Neuropodia concial, truncate, with neuroaciculum and about 8 simple setae of varying lengths usually terminally bifid. Long neurosetae smooth; short neurosetae spinous. Prostomium without eyes, with a minute median antenna and two short, lateral antennae. Prostomium also with subtriangular palpophores and minute palpostyles. Two pairs of short tentacular cirri present. Ventral cirri begin on setiger 3.

Fig. 93. *Sigambra bassi* - Hartman, 1945. Body cylindrical anteriorly becomming dorsoventrally flattened posteriorly. Prostomium with biarticulate palps with large palpophores and small palpostyles. A long median antenna is present and two shorter lateral antennae. Tentacular segment longer than following segments and with two pairs of tentacular cirri similar to lateral antennae.

First setiger with long dorsal cirri. Notopodia conical with acicula curving distally. Stout notopodial hooks begin after setiger 10 (10-15). Dorsal cirri long, extending beyond setal lobes. Neuropodia conical with acicula and numerous finely serrated setae of variable lengths with capillary tips. Ventral cirri begin on setiger 3, extend slightly beyond setal lobes. Proboscis with conical papillae distally. Pygidium with long paired anal cirri.

PLATE 18 (Figures 90-93)



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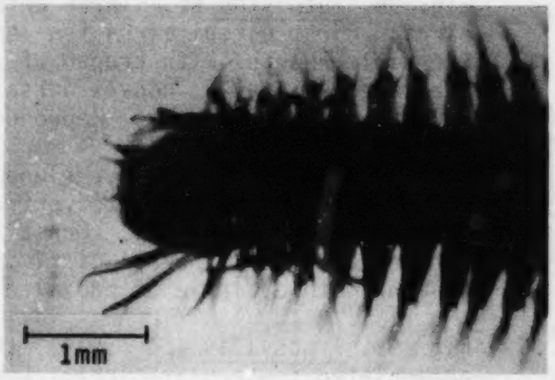

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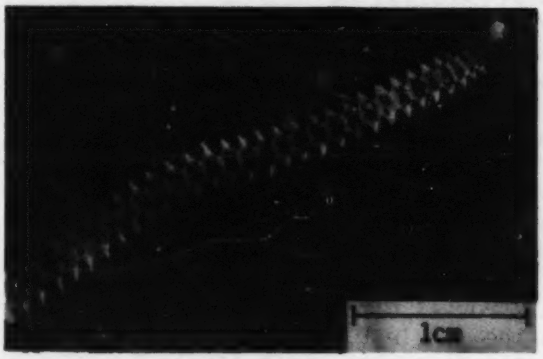

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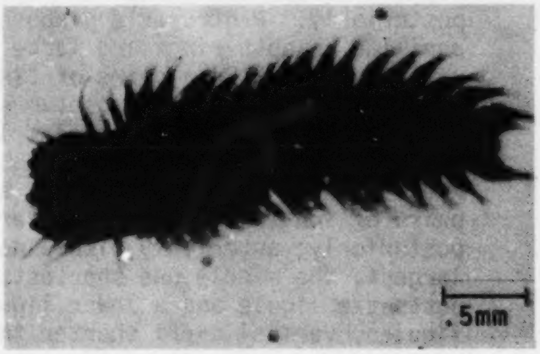

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Not Fig. *Sigambra tentaculata* - Treadwell, 1941. This species is very similar to *S. bassi* (above). However, in *S. tentaculata* the stout hooked setae begin on setiger 4 as opposed to setiger 10-14 for *S. bassi*.

FAMILY SYLLIDAE - Grube, 1850

Fig. 94. *Autolytus* sp. Three antennae and two pairs of tentacular cirri. First dorsal cirri the longest. Nuchal organs present. Eversible pharynx with trepan of varying number of teeth. Body flattened ventrally, convex dorsally. Prostomium suboval, palps poorly developed, fused. Reproduction is by budding off of stolens.

Fig. 95. *Exogone* sp. Tiny, slender, threadlike, tapered slightly at both ends; dorsally convex, ventrally flattened. Three antennae; one pair of tentacular cirri. Dorsal and ventral cirri shorter than the parapodial lobes. Dorsal cirri ovoid or papilliform. Eversible pharynx with a circle of papillae and one tooth.

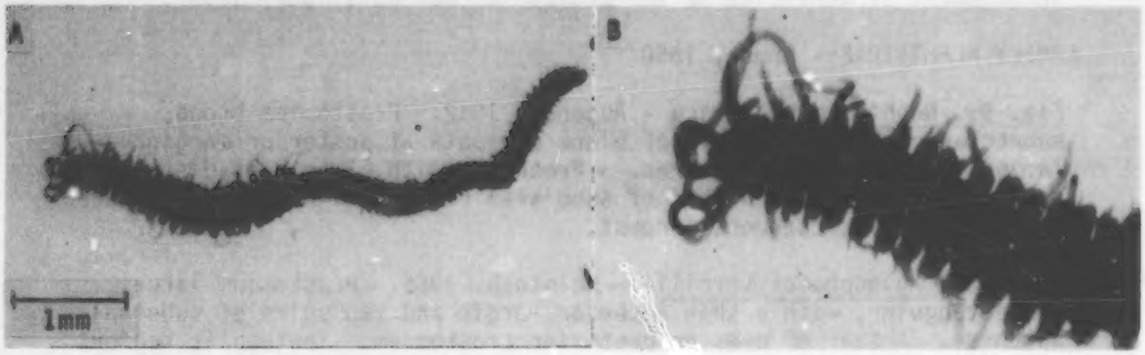
Fig. 96. *Typosyllis* sp. Small, three antennae, two pairs of articulated tentacular cirri. Eversible pharynx with one tooth. Setae with uni-or bidentate falcigers as well as simple setae in posterior setigers.

FAMILY NEREIDIDAE - Johnston, 1845

Fig. 97. *Laeonereis culveri* - Webster, 1879. First two parapodia without notosetae. Dorsal cirrus small decreasing in size posteriorly. Protrusable proboscis consisting of two rings; groups of papillae on both rings and large single papillae on anterior ventral-lateral areas. Four pairs of tentacular cirri; parapodia biramous. Notosetae spinigers; neurosetae spinigers and posteriorly with falcigers. Inferior notopodial lobes.

Fig. 98. *Nereis succinea* - Frey and Leuckart, 1847. Body long. Four pairs of long, slender tentacular cirri. Parapodia very anteriorly to posteriorly; anteriorly with 3 notopodial ligules, the upper one largest, the middle one shortest. Neuropodium with setigerons lobe, postsetae ligule and a lower ligule. Dorsal cirri about as long as ligules, ventral cirri shorter than the ligules. Posteriorly the parapodia are markedly different; notopodium with upper ligule elongated, flattened obliquely truncate distally, dorsal cirrus terminally located; middle notopodial ligule reduced or lacking, lower one short, concial. Neuropodium similar to anterior region except postsetal ligule reduced or lacking. Eversible proboscis with amber colored jaws and dark patches of denticles.

PLATE 19 (Figures 94-98)



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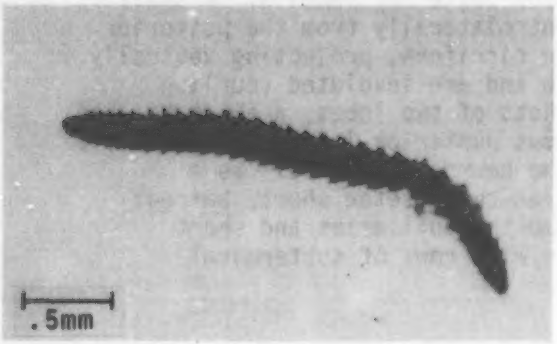

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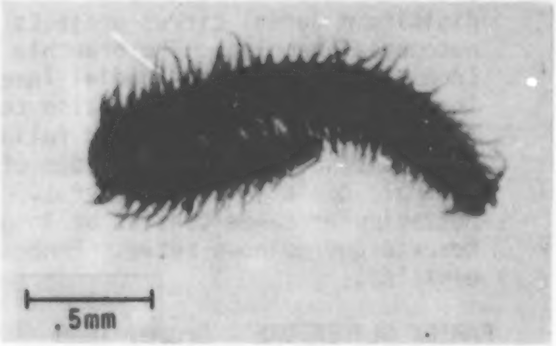

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Not Fig. Neanthes acuminata - Moore, 1903c. This species was also recovered from the Tampa Bay area and is very similar to N. succinea. The easiest way of distinguishing the two species is by the arrangement of denticles on the proboscis (see Pettibone, 1963).

FAMILY NEPHTYIDAE - Grube, 1850

Fig. 99. Nephtys magellanica - Augener, 1912. Prostomium broad, subrectangular, with a pair of black eyespots at posterior margin. Two pairs of tapering antennae. Proboscis with 22 rows of distal papillae and an equal number of subdistal rows, proximally the surface is smooth. First segment longest.

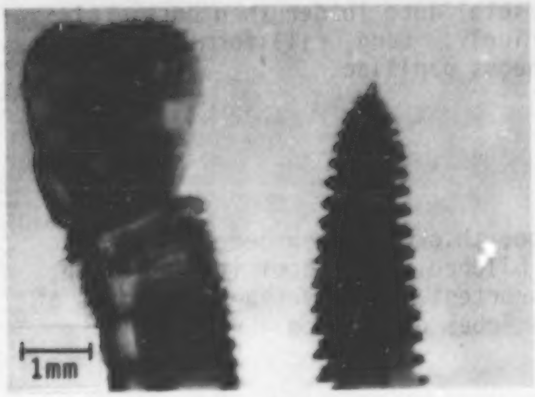
Fig. 100. Aglaophamus verrilli - McIntosh, 1885. Prostomium large, subrectangular, with a thin anterior margin and two pairs of subequal antennae. A pair of eyes on posterior prostomium. Tentacular segment enlarged ventrally and laterally. Ventral tentacular cirri larger than antennae; slender often curved dorsal tentacular cirri. Parapodia with conical acicular lobes. Notopodia with a short anterior lamella and a large foliaceous posterior lamella. A small digitiform dorsal cirrus projects ventrolaterally from the posterior notopodial lamella. The branchia are cirriform, projecting ventrally from the posterior notopodial lamella and are involuted (curling inwardly). The neuropodia also consists of two lobes, a short bilobed anterior lamella and a broad foliaceous posterior lamella. There is a short cirrius on the upper edge of the neuropodia as well as a ventral, conical ventral cirrus. Preacicular setae short, barred; postacicular setae consist of long smooth capillaries and short furcate and spinous setae. Proboscis with rows of subterminal papillae.

FAMILY GLYCERIDAE - Grube, 1850

Fig. 101. Glycera americana - Leidy, 1855. Prostomium long with annulations; parapodia with 4 conical lips, 2 presetal ones longer than 2 postsetae ones. Branchiae retractile, form a conspicuous tuft when extended. Proboscis with small, subconical and larger ovate organs.

Fig. 102. Glycera dibranchiata. Parapodia with two sharply conical presetal lobes. Two bluntly conical postsetal lobes; anteriorly the upper lobe short rounded, the lower longer, bluntly conical, in the midregion, both postsetal lobes bluntly conical, the upper one shortest. Posterior parapodia may have a single rounded postsetal lobe. Two nonretractile branchiae; upper one between the dorsal cirrus and the notopodium, the lower one anterior to the ventral cirrus. Proboscis organs all similar, small, conical, flattened.

PLATE 20 (Figures 99-102)



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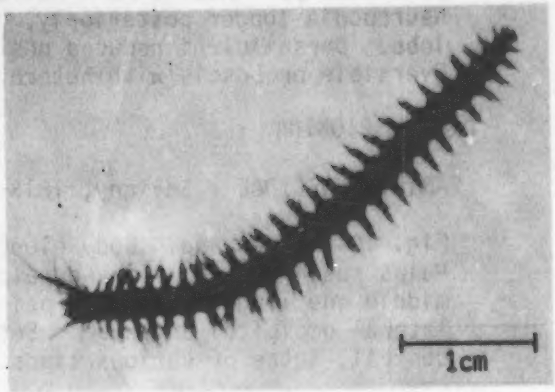

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FAMILY GONIADIDAE - Kinberg, 1866b

Fig. 103. Glycinde solitaria - Webster, 1880. Prostomium conical, acute with nine annulations (rings) and four small slender antennae, with a pair of eyes in the basal ring and a pair in the distal ring. Dorsal and ventral cirri large, conical. Presetal and postsetal neuropodial lobes narrow about as long as cirri, neurosetae long, compound spinigers in a fan shaped group. Parapodia become biramous posteriorly. Three to six notosetae, acicular, falcate and hooded. Neuropodia longer posteriorly, presetal lobe longer than postsetal lobe. Dorsal cirri reduced posteriorly. Long, filliform anal cirri. Eversible proboscis with heterogeneous papillae.

ORDER SPIONIDA

FAMILY EUNICIDAE - Savigny, 1818

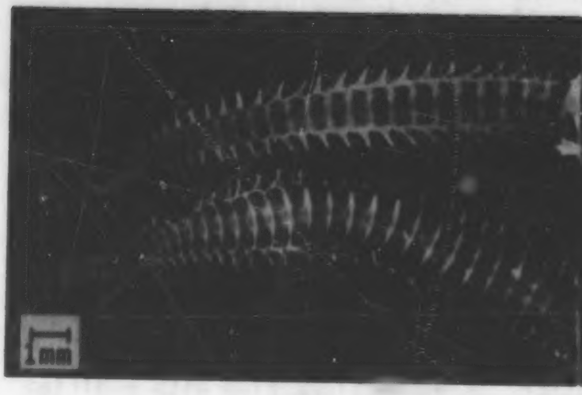
Fig. 104. Eunice sp. Body elongate, thickened, rounded anteriorly. Palps fused, prostomium and palps bilobed. Five occipital antennae, middle one longest, lateral pair shortest. Two eyes between bases of lateral occipital antennae. Setal lobes of parapodia rounded to conical, setae of various kinds.

Fig. 105. Marphysa sanguinea - Montagu, 1815. Resembles Eunice but peristomial cirri are absent. Anterior segments narrow, cylindrical; posteriorly beoming wider and flattened. Five short, smooth prostomila antennae. Branchiae begin on segment ten or later, with 2-6 pectinate filaments. Dorsal and ventral cirri short, digitiform. Various setal types; heterogomph spinigerous, posterior bifid, hooded acicula; and anteriorly to posteriorly varying comb setae.

FAMILY ONUPHIDAE - Kinberg, 1865

Fig. 106. Diopatra cuprea - Bosc, 1802. Live in long permanent tubes. Anterior end cylindrical becoming dorsoventrally flattened more posteriorly, tapering abruptly at posterior end. Prostomium suboval with two short conical antennae and five occipital antennae with about 8-10 basal (ceratophore) rings. Large ventral, globular palps present. Parapodia of first four setigers modified, extending anterior ventrally and slightly enlarged. Dorsal cirri short, becoming longer, more cirriform posteriorly. Ventral cirri short, conical on first five setigers, wide and flat from six on. Branchiae begin on setiger 4 or 5, with a short, cylindrical base and spiraled filaments. Branchiae become gradually reduced posteriorly.

PLATE 21 (Figures 103-106)



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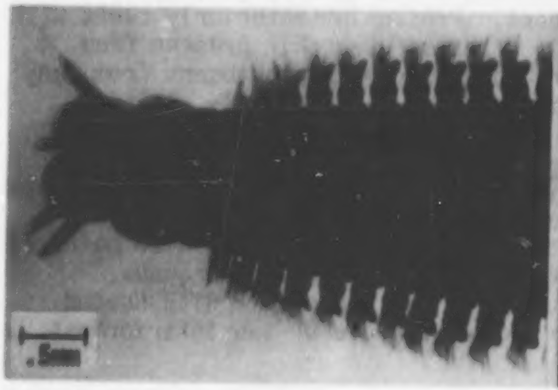

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Fig. 107. Onuphis eremita oculata - Hartman, 1951. Long slender body. Prostomium with two circular eyespots behind the frontal antennae, and a shallow median sulcus. Branchiae with single filaments present from the first setiger increasing to two filaments at about segment 20 for about 8 segments, and 3-6 pectinate filaments to about the posterior third of the body; filaments then diminish to two and gradually to a single small knob. Dorsal cirri larger than branchiae and similar throughout. Ventral cirri cirriform for about six segments, then padlike. Their tube is long and flexible consisting of a thin membrane coated with a layer of fine sand.

FAMILY LUMBRINERIDAE - Malmgren, 1867

Fig. 108. Lumbrineris spp. Peristomium conical to rounded, with or without 1-3 nuchal papillae. Without eyes. Palps present. Proboscis with paired ventral mandibles.

FAMILY SPIONIDAE - Grube, 1850

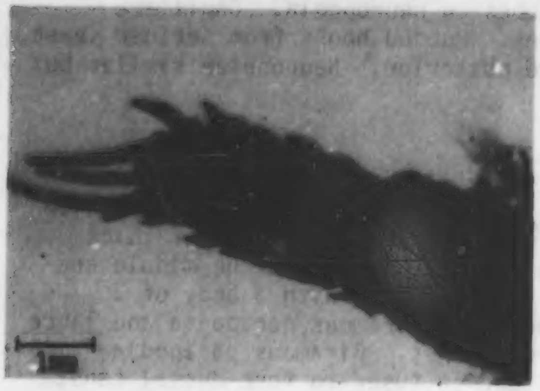
Fig. 109. Polydora ligni - Webster, 1879. Setiger five with modified setae, branchia first present on setiger seven and continue for only a few segments. Prostomium anteriorly cleft, with four dark eyespots. Prostomial caruncle with a median antenna inserted between the palpal bases.

Fig. 110. Polydora socialis - Schmarda, 1861. Setiger five with modified setae, that are heavy acicular, nearly straight, and blunt. Neuropodia with bifid, hooded hooks. Prostomium anteriorly cleft with many small eyespots, between palpal bases. Branchia present from segment eight becoming larger on middle segments and absent from many posterior segments. Pygidium with a broad disc dorsally cleft.

Fig. 111. Paraprionospio pinnata - Ehlers, 1901. Prostomium anteriorly rounded, 2-6 small eyes which may be faded. Vertical wings lateral to prostomium formed from the fused peristomium and first setiger. Palps long with a membrane along outer side. Three pairs of branchia on setigers 2-4. Anterior notopodia long, membranous, distally pointed, diminishing posteriorly. Neuropodia with hooded uncini alternating with capillary setae and one or two inferiormost genital spines.

Fig. 112. Prionospio heterobranchia - Moore, 1907. Elongate, snoutlike prostomium. Two pairs of eyes, one large pair, one small. Five pairs of branchia, the second and third pairs smooth and cirriform, the others pulmose. Neuropodia with pointed setae on all segments, additionally hooded hooks begin at about segment 14 and gradually increase in number. Hooded hooks also present in notopodia first present in segment 35 and increasing in number posteriorly.

PLATE 22 (Figures 107-112)



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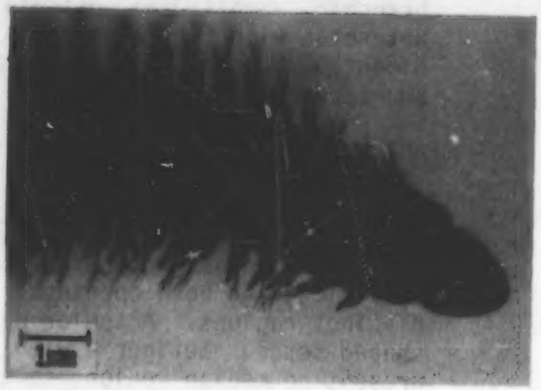

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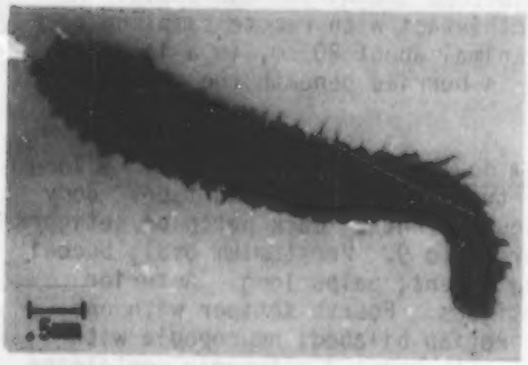

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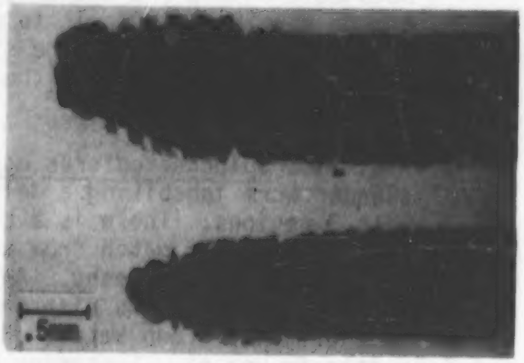

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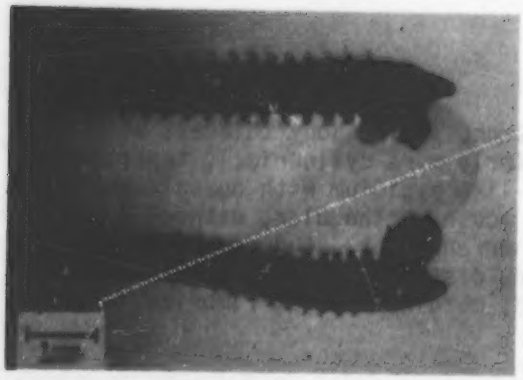

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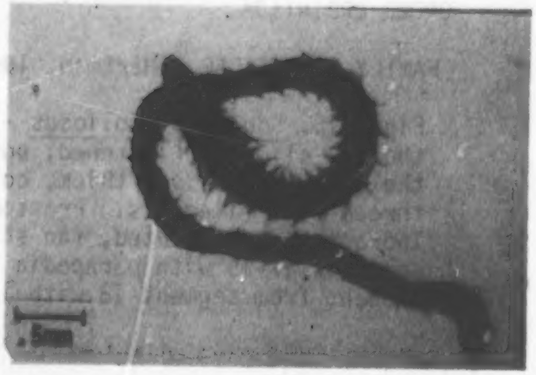

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Fig. 113. Spio pettiboneae - Foster, 1970. Prostomium rounded anteriorly, extending back to setiger two. Two pairs of small eyes. Peristomium broad, partially fused setiger one. Each setiger with small notopodial and neuropodial lobes and a pair of long curved branchia. Small oval postsetal lobes on neuropodia. Capillary notosetae with fine punctate blades. Hooded hooks from setiger seven, bidentate becoming tridentate more posterior. Neurosetae similar but shorter.

FAMILY CHAETOPTERIDAE - Malmgren, 1867.

Fig. 114. Chaetopterus variopedatus - Renier, 1804. Commonly called the "parchment worm" because it inhabits a secreted tube of thick paperlike consistency which is "U" shaped, widest in the middle and constricted at both openings. A filter feeder with a body of 3 distinct regions. Anterior region with uniramous parapodia and lance shaped setae. Setiger 4 with stout spines. Biramous parapodia present on median region; some notopodia fused to form dorsal fans; all notopodia of median region asetigerous; pectinate uncini on neuropodia. Posterior region with long, pointed, asetigerous notopodia with a few acicula; pectiniform uncini in neuropodia. A common worm but difficult to collect intact with remote sampling gear because of relatively large size (animal about 20 cm, in a larger tube) and the depth which the tube is burried beneath the sediment (to about 10-15 cm).

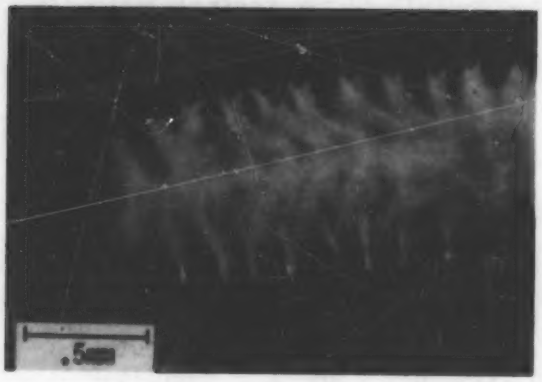
Fig. 115. Spiochaetopterus costarum oculatus - Webster, 1879. A long slender worm inhabiting a delicate transparent annulated tube. Body with 3 regions. There is a conspicuous ventral dark patch on setigers 6 and 7, a white patch from setigers 7 to 9. Prostomium oval; buccal segment large and fleshy. Antennae absent; palps long. Anterior region with uniramous flattened setigers. Fourth setiger with one pair of stout brown setae. Middle region bilobed; neuropodia with pectinate uncini. Posterior region with pointed notopodia containing acicula; neuropodia with pectinate uncini.

ORDER ORBINIIDA

FAMILY ORBINIIDAE - Hartman, 1942

Fig. 116. Scoloplos foliosus - Hartman, 1951. Body thickest at thorax, slightly flattened; posteriorly more cylindrical, tapering to the end. There is a thick, collar-like pygidium with dorsolateral thread-like filaments. Prostomium acute, triangular, without eyes. Thoracic setae pointed, fan shaped arrangement. Abdomen begins at segments 17-19 with parapodia having distinct lobes. Branchiae present from segment 18 with lateral margins of long fimbriae.

PLATE 23 (Figures 113-116)



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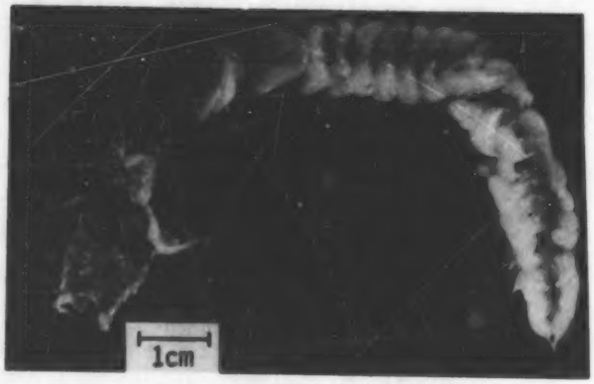

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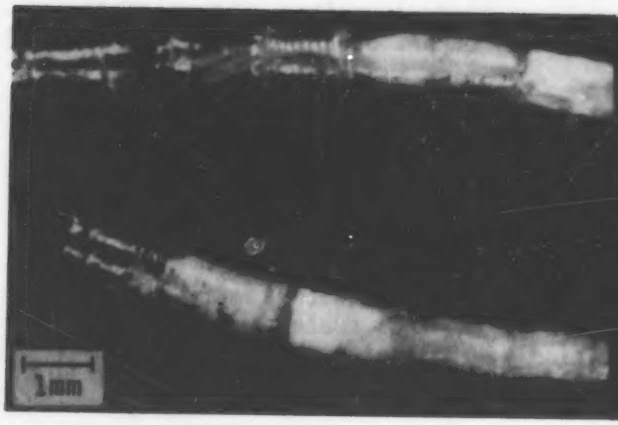

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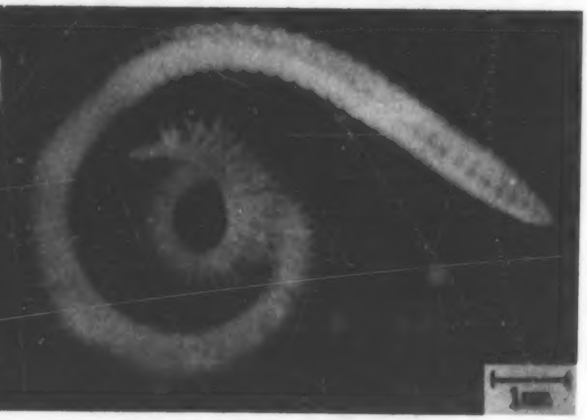

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Fig. 117. Scoloplos rubra - Webster, 1879. Long and slender, the thorax dorsoventrally flattened; an acute equitriangular prostomium, and lacking eyes. Large branchiae present from segment six. Thoracic neuropodia with 3-5 rows of uncinal hooks and a few slender pointed setae in the upper portion of the fascicle. Abdominal notopodia with 2 or more furcate spines. Abdominal notoacicula embedded about 3 to a fascicle, neuroacicula single, thick projecting curved rods. Ciliated dorsal mounds begin near the end of the thoracic region and become more prominent on later segments. Two dorsal and two ventral anal appendages.

ORDER CAPITELLIDA

FAMILY OPHELIIDAE - Malmgren, 1867

Fig. 118. Travisia hobsonae - Santos, 1977. A short subfusiform-fusiform body (a) to about 27 mm in length completely covered with small, rounded pustulae; 30-31 setigerous segments, 28-29 pairs of branchiae (or fewer in juveniles) which begin on setiger 3. Small conical prostomium with 2 nuchal pits on dorsal base (b). Segment 1 achaetous, segment 2 biannulate dorsally but not ventrally. Mouth ventral (c) between setigers 1 and 2 (segments 2 and 3). Eversible proboscis segment, well developed, folded and smooth. Setigers 2-12 triannulate, 13-26 or 27 biannulate, annuli discontinuous laterally; setae inserted on posterior annuli (f). Setigers 27 to 28 to end entire. Nono- and neuropodial setae, simple capillary and hispid (g), present on all setigers. Simple cirriform branchiae present from setiger, often withdrawn into body. Terminal anus surrounded by 5 large, rounded lobes (e), and in larger specimens, up to 4 minor lobes. Since this species was only recently described, the original drawings have been reproduced (courtesy of Dr. Stuart L. Santos).

ORDER TEREBELLIDA

FAMILY TEREBELLIDAE

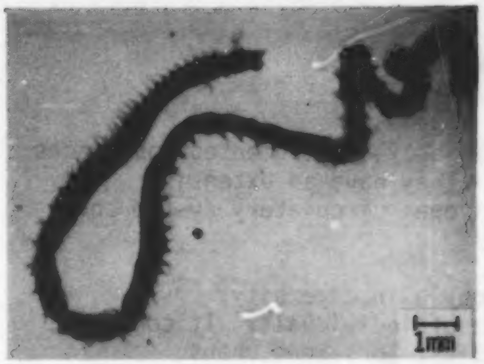
Fig. 119. Pista cristata - Muller, 1776. Body tapering posteriorly. Thorax consists of 17 setigers with uncini present from setiger 2. Many abdominal segments. Prostomium with many dorsal long slender tentacles; ventrally with a straight distal edge with a medial notch. Large lateral luppets on segments 2-4. Ventral scutes present on thorax, decreasing in size posteriorly. Notosetae present from segment 4. Uncini each consist of a large main fang and surmounted by several rows of many teeth.

CLASS OLIGOCHAETA ORDER HAPLOTAXIDA

FAMILY TUBIFICIDAE

Fig. 120. Some examples of Tampa Bay oligochaetes.

PLATE 24 (Figures 117-120)



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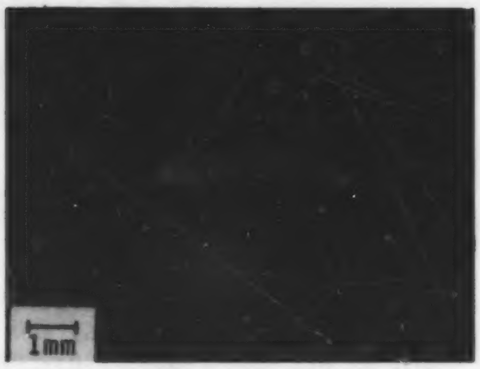

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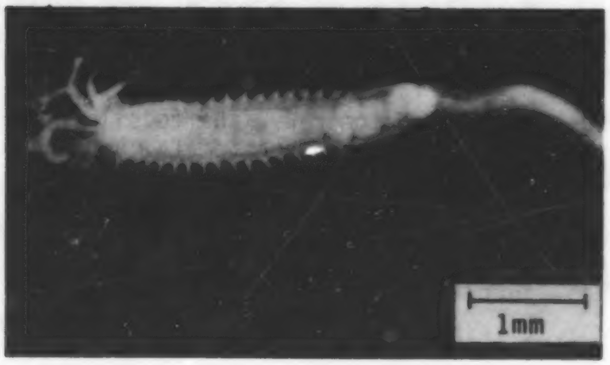

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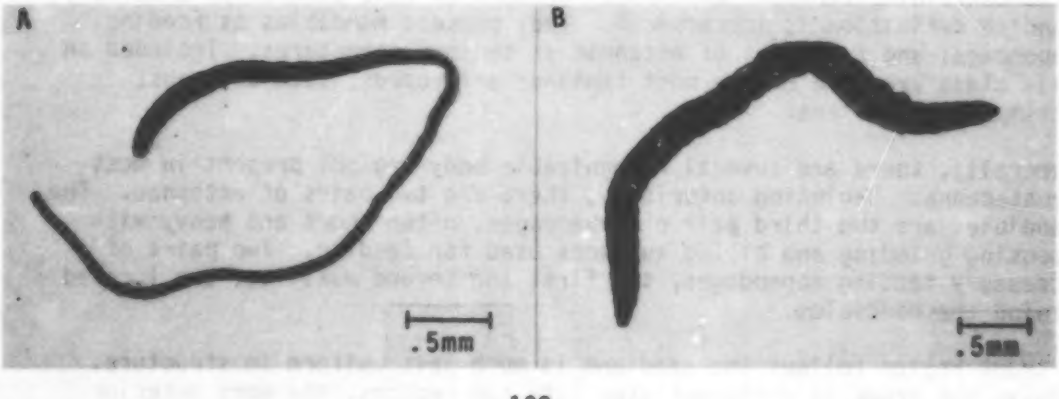

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SECTION 7

PHYLUM ARTHROPODA

Definition: The arthropods have a segmented body and segmented appendages with a chitinous exoskeleton. They have an extensive hemocoel, a reduced coelom, an open circulatory system and a complete digestive tract.

The phylum Arthropoda surpasses all other phyla in diversity, distribution, number of species, and number of individuals. It contains the insects, spiders, crustaceans, pycnogonids, horseshoe crabs, millipedes, centipedes, etc. The arthropod exoskeleton is a chemical complex containing chitin, a nitrogenous polysaccharide. There are three major body regions: a head, thorax, and abdomen, each composed of one or more segments. The arthropods are believed to have evolved from the polychaetes or from an ancestor common to both.

There are three subphyla: Trilobitomorpha, the fossil trilobites; Chelicerata, consisting of the classes Merostomata, Arachnida and Pycnogonida: and Mandibulata, which includes six classes, the Crustacea, Insecta, Chilopoda, Diplopoda, Symphyla, and Pauropoda. Only three of these classes -- the Merostomata, the horseshoe crabs; Pycnogonida, the sea spiders; and the Crustacea -- have living marine representatives which are considered in this text.

CLASS CRUSTACEA

The crustaceans are a highly diverse assemblage, primarily aquatic but also containing terrestrial forms. Because of this diversity, a useful, concise definition is impractical. They possess mandibles as feeding appendages and two pairs of antennae as sensory structures. Included in this class are some of the most familiar arthropods, such as crabs, shrimps and lobsters.

Generally, there are several recognizable body regions present in most crustaceans. Beginning anteriorly, there are two pairs of antennae. The mandibles are the third pair of appendages, often short and heavy with opposing grinding and biting surfaces used for feeding. Two pairs of accessory feeding appendages, the first and second maxillae, are located behind the mandibles.

A trunk region follows the head and is much less uniform in structure. Always the trunk is differentiated into two regions, the more anterior thorax and a more posterior abdomen. The number of segments present in each region may characteristically vary from group to group. In many crustaceans, a dorsal carapace covers the thorax, and is fused to varying degrees with the underlying segments. In some crustaceans, such as the Ostracoda, the carapce completely encloses the body like bivalve shell. The appendages of the thorax are multi-segmented and typically biramous. The anterior appendages are usually modified for feeding or grasping, the more posterior appendages modified for walking or swimming. The appendages of the abdomen, also biramous, are usually modified for swimming or gas exchange.

Many groups of Crustacea are represented by the Tampa Bay fauna. Of these groups, the Amphipoda, Decapoda and Isopoda were usually the most abundant both in numbers of species and individuals. However, groups such as the Cumacea and Ostracoda were represented by a few species that occasionally occurred in large numbers.

SUBCLASS CEPHALOCARIDA (Figure 121) ORDER REMITEDIA

Definition: Cephalocarida are small, shrimplike crustaceans up to 3 mm in length. They have a horseshoe-shaped head without eyes and with two pairs of short antennae. The head is followed by an elongated trunk of nineteen segments, eight or nine of which bear nearly identical triramous appendages.

This subclass was established after the discovery of a unique primitive crustacean Hutchinsoniella macracantha Sanders, 1955, from Long Island Sound. Since that time, seven additional species of cephalocarids have been described from benthic studies over various parts of the world.

Only one species of cephalocarid was taken from Tampa Bay, Lightiella floridana McLaughlin, 1976. This species was first recorded from Anclote Anchorage and is presently the only cephalocarid known to occur in the Gulf of Mexico.

SUBCLASS OSTRACODA (Figures 122-124) ORDERS PODOCOPIDA, MYODOCOPINA

Definition: Body entirely enclosed in a bivalved carapace, hinged dorsally with a noncalcareous cuticle and closed by transverse muscles. Generally small with adults less than 1 mm in length, but some species 1-2 mm in length.

There are about 2,000 described species inhabiting both marine and fresh water. The carapace may be pigmented and bear spines, setae and tubercles, and conceals the internal anatomy. The body has lost all traces of segmentation with the trunk being much reduced, and the head comprising about one-half the body. The head bears four pairs of appendages; antennules, antennae, mandibles and maxillae. The thoracic region has three or fewer pairs of appendages usually modified for grooming, locomotion or other functions.

Most ostracods are burrowers, or crawl about among benthic plants and detritus.

Ostracod faunas of the Tampa Bay area have not been well studied. Identification requires disection and detailed examination of the various body parts. Due to their small size, and because many species exhibit sexual, ontogenetic and environmentally caused polymorphisms, ostracods are often ignored in benthic studies. However, three species recognizable by external characteristics and large enough to be retained on a 0.5 mm sieve were collected from Tampa Bay. Descriptions given here are brief and based only on the externally visible characters. The appropriate literature should be consulted for positive identification.

SUBCLASS CIRRIPEDIA (Barnacles) (Figure 125)

Definition: Crustaceans enclosed in a shell of calcareous plates, which may be interlocking and conical in shape or flattened and held together by tissue.

Barnacles are the only sessile group of crustaceans apart from exclusively parasitic forms. They are exclusively marine and most species are free-living, attaching to any firm substrate. Some barnacles live as commensals and there are also large numbers of parasitic forms. Only one species of barnacles, Balanus amphitrite Darwin, 1854, was regularly collected from the Tampa Bay benthos. These specimens were usually attached to fragments of shell or other sold debris.

ORDER THORACICA

Definition: Barnacles with six pairs of well-developed cirri, and the mantle usually covered with calcareous plates. Free-living and commensal forms.

SUBORDER BALANOMORPHA (Acorn Barnacles)

Definition: Symmetrical sessile barnacles enclosed by rigid wall plates (Carina) and with the aperture closed off by the paired moveable terga and scuta.

SUBCLASS MALACOSTRACA (Figures 126-204)

The subclass Malacostraca contains about three-fourths of all the crustacean species and most of the larger forms, such as crabs, lobsters and shrimp. A basic malacostracan is composed of fourteen segments and a telson. The first eight segments form the thorax, and the last six the abdomen; all segments bear appendages. The first antennae may be biramous. The exopodite of the second antennae may be a flattened scale. The mandible may bear a palp; each maxillae usually bears a palp.

The thoracic appendages (legs) may be similar or variously modified. The first one, two, or three pairs may be modified to form maxillipeds. The fourth and fifth may be chelate and subchelate.

The first five pairs of abdominal appendages, usually biramous and similar, are called pleopods. The pleopods may be used for swimming or may be modified to carry eggs or for gas exchange. The sixth pair of abdominal appendages is usually modified into large flattened pieces (uropods) which, in conjunction with the flattened telson, may be used for swimming.

There is a great deal of variation among the orders of Malacostraca from the basic body plan.

ORDER NEBALIACEA (Figure 126)

Definition: Primitive shrimplike Crustacea with a well-developed carapace covering but not fused with the thoracic segments. Anteriorly, there is a short, hinged rostral plate. Stalked eyes are present. There are seven abdominal segments instead of the usual six present in other Malacostraca. Eight pairs of similar thoracic appendages; the major segments flattened. Abdomen with four pairs of biramous swimming appendages and two pairs of smaller uniramous appendages.

ORDER STOMATOPODA (Mantis Shrimps) (Figure 127)

Definition: Body elongate, dorsoventrally flattened. They have a small, shield-like carapace; four thoracic segments are exposed. The abdomen is longer than the thorax. The telson is broad, uropods biramous. Eyes are on stalks, first antennae large, triramous, with a large fringed antennal scale. There are eight thoracic appendages; the first five are uniramous and subchelate, the second pair is greatly enlarged for raptorial feeding; the last three are slender and not chelate. The pleopods are well developed and bear gills.

Most stomatopods live within burrows excavated in the benthos. Although they may be quite common, they are seldom collected with sampling gear which does not penetrate deeply into the sediment because of the depth of the burrows. Mantis shrimps are raptorial, feeding on small fish, crustaceans and other invertebrates.

Only one species of stomatopod, Squilla empusa Say, 1818, representing the family Squillidae, was collected from Tampa Bay.

ORDER MYSIDACEA (Figures 130-132)

Definition: Small shrimp-like crustaceans, most of which are from a few millimeters to several centimeters in length. Thorax covered with a carapace, which is not united with the last four thoracic segments. The carapace may extend anteriorly as a rostrum. The compound eyes, when present, are stalked. The first and sometimes second thoracic appendages are modified as maxillipeds. The remaining six or seven pairs of thoracic appendages are similar and may be subchelate. The antennules are biramous; the antennae have a large scale-like exopodite. The pleopods may be reduced; the uropods are flattened, forming a fan tail.

There are two suborders of mysids: the Lophogastrida, primarily oceanic demersal or planktonic forms; and the Mysida, which are considered here. Most of the Mysida, including the two species shown below, have a statocyst within the proximal third of the uropod endopod (Figure 128). Females have 2-3 pairs of oostegites forming a brood pouch, where the young are maintained until hatching (Figure 129). There is no free larval stage.

Mysids were collected regularly from the study area, but never in large numbers.

ORDER CUMACEA (Figures 133-136)

Definition: Small pericaridans with an enlarged head and thorax and a long, narrow abdomen which terminates in slender biramous uropods. Carapace present and fused with the first 3-4 thoracic segments, leaving 4-5 segments exposed. Females lack abdominal appendages except for uropods; males vary having 0-5 pairs of pleopods. Eyes may be lacking or small or medially fused.

The enlarged thorax and long, narrow abdomen give the Cumacea a very distinctive shape. Some species may grow as large as 35 mm, but most species including those from Tampa Bay, are only 3-8 mm in length as adults. The cumaceans burrow just beneath the surface of the sediment where they feed by removing food particles from sand and detritus. Some of the characteristics important for identification are: the presence or absence of a free telson, the shape and ornamentation of the carapace, the number of segments comprising the uropods, numbers of spines, etc.

ORDER TANAIDACEA (Figure 132)

Definition: Small peracaridans with the cephalothorax composed of the first and second thoracic segments, forming a short carapace. The first pair of thoracic appendages are modified as maxillipeds, the second pair as fully chelate gnathopods, and the third pair adapted for burrowing. The remaining five pairs of legs are usually similar.

The tanaids bear similarities to both the Isopoda and Cumacea. They were formerly classified with the isopods and many keys and invertebrate guides treat both orders simultaneously. They are almost exclusively marine and usually small, less than 5 mm in length. Tanaids were infrequently collected, the few specimens obtained were not identified to species level.

ORDER ISOPODA (Figures 138-147)

Definition: Dorsoventrally-flattened peracaridans without a carapace. There are two pairs of uniramous antennae. The eyes are sessile. The first pair of thoracic appendages are modified to form maxillipeds, the remaining seven pairs are uniramous and usually adapted for crawling; the first three may be prehensile or subchelate. There are five pairs of leaf-like pleopods, and a single pair of uropods (usually biramous).

The Isopoda is the largest order of crustaceans aside from the Decapoda. Most species are marine, although there are also freshwater, terrestrial, and parasitic forms. In spite of their abundance, isopods are rarely obtained from the soft bottom benthos of Tampa Bay. Most species perfer solid substrates and can be found crawling on pilings, mangrove roots or driftwood, or among barnacles, oysters, or shell material. They are also found clinging to algae or seagrasses. Some species of isopods (the wood borers) are economically important because of the extensive damage they can cause to deck pilings, boats, and other wooden structures.

SUBORDER ANTHURIDEA (Figure 138-140)

Definition: Body cylindrical and long, usually over 5 times as long as wide. The exopods of the uropod are usually flexed over the telson. The first pair of peraopods are usually enlarged and subchelate. The first pair of pleopods modified to form an operculum covering the other pairs.

FAMILY ANTHURIDAE (Figure 138-140)

Definition: In addition to the characteristics for the suborder, the ANTHURIDAE frequently possess statocysts on the pleotelson; the mouth parts are normal (i.e. adapted for chewing); and the first pair of peraeopods are subchelate.

SUBORDER VALVIFERA (Figure 141-146)

Definition: The uropods are attached ventrolaterally to form a cover over the pleopods. The first antennae are stout with the flagellum formed of a single fused segment. The mandible is without a palp.

FAMILY IDOTEIDAE (Figures 141-143)

Definition: Valvifera with distinct dorsoventrally-flattened bodies; second pair of antennae usually longer than the first; flagellum with a single, long article and few or no apical articles. Pareopods all similar, first pair usually stout. Mouth parts of chewing and biting types, well developed. Uropods mostly uniramous.

FAMILY SPHAEROMIDAE (Figures 144-146)

Definition: Body usually short, oval and convex. Cephalon separated from the first peraeonal somite. Pleopods are enclosed within a chamber formed by the pleon and pleotelson. Animals characteristically contract into a complete or partial ball.

This family was further divided into three groups (Hansen, 1905) based on the structure of the pleopoda: the Hemibranchiatae, Eubranchiatae, and the Platybranchiatae. Further discussion of these groups is not necessary for this manual. For further information, see Hansen (1905) or Menzies (1968).

SUBORDER ASELLOTA (Figure 147)

Definition: Contains a large number of species usually very small in size. All or most of the pleonal segments are fused. The first or first and second pleopods form an operculum over a branchial cavity.

This suborder is further divide into three superfamilies (based on the pleopodal structures): Stenetrioidea, Aselloidea, and Paraselloidea (see Menzies, 1962).

ORDER AMPHIPODA (Figures 148-179)

Definition: Paracaridans of small to medium size without a carapace and usually laterally compressed to a varying degree. First and/or second thoracic segments may be fused to head. Seven thoracic segments, the paraeon, bearing uniramous walking appendages. Six abdominal segments; the first three referred to as the pleon with paired biramous pleopods, the last three with paired biramous uropods. Two pairs of antennae present. Eyes normally sessile. Eggs are carried in a brood pouch.

The order Amphipoda is a large group of crustaceans with marine freshwater and terrestrial representatives. There are four recognized suborders: Gammaridea, Hyperiidea, Caprellida, and Ingolfiellidea. There are no representatives of the Hyperiidae, exclusively marine and pelagic; or the Ingolfeillidae, a tiny interstitial group presented here.

Figure 149 shows a generalized gammaridean amphipod. Virtually all of the labeled features are modified to various degrees among the different families and species.

SUBORDER GAMMARIDEA (Figure 148-179)

Definition: Body shrimplike. Peraeon with seven segments, appendages possessing large coxal plates. Abdomen with six segmets and with appendages. Eyes usually present. Pleopods biramous; three pairs of uropods; uropods are biramous.

The Gammaridea is the largest of the four suborders, containing over 3300 species.

FAMILY GAMMARIDAE (Figure 148)

Definition: Basically the same characters as the suborder definition. Antennae with accessory flagellum. Gnathopods one and two subchelate, second usually larger. Peraeopods three through five successively increasing in length. Peduncle of uropod one with proximal anterior spines; rami of uropod three usually foliaceous. Telson often deeply cleft.

FAMILY MELITIDAE (Figures 150-152)

Definition: Body smooth, slender. Coxae shallow. Gnathopods, antennae and uropod three exhibit varying degrees of sexual dimorphism. Eye small, round. Gnathopod two larger than one. The seventh peraeopod is the longest. Peduncle of first uropod has an anterior proximal spine. Uropod three is large, spinose, with inner rami usually reduced. Telson cleft, bearing spines.

FAMILY LILJEBORGIIDAE (Figure 153)

Definition: Coxae large, deep. Pleosome and urosome may be dorsally dentate or spinose. Gnathopods, uropods and telson sexually dimorphic. Antennae two longer than antennae one. Accessory flagellum with two or more segments. Gnathopods large, subchelate. Seventh peraeopod is longest. Uropods are biramous; rami of uropod three are lanceolate. Telson deeply cleft.

FAMILY BATEIDAE (Figure 154)

Definition: Body smooth or dorsally carinate. Third and fourth coxal plates large; first coxa reduced; coxa five with an extended posterior lobe. Eye large, rectangular; head with a depressed rostrum. Both antennae long, subequal, without accessory flagellum. First gnathopod vestigal, second subchelate. Paraeopods five through seven increasing in length. Telson short, cleft.

FAMILY STENOTHOIDAE (Figures 155-156)

Definition: Body small, smooth. Coxa of segments two to four large, shield-like; coxa one small, covered by coxa two. Head short; round eyes. Antennae two slightly longer than antennae one; accessory flagellum small or missing. Gnathopod one subchelate or simple, smaller than gnathopod two, which is subchelate. Remaining paraeopods short, nearly equal in length. Third uropod uniramous. Telson entire.

FAMILY LEUCOTHOIDAE (Figure 157)

Definition: Body short, compact, smooth. Antennae short, flagellae shorter than peduncles; accessory flagellum very small. Coxae variable. Gnathopod one chelate, carpus lobe very slender elongate; gnathopod two subchelate, very large. Basis of peraeopods three through five broad. Uropod one longer than uropod two. Telson entire.

FAMILY OEDICEROTIDAE (Figures 158-159)

Definition: Rostrum large; body smooth with large abdomen. Eyes located dorsally, appear as one. Antennae two longer than antennae one; accessory flagellum small or lacking. Coxal plates moderately deep. Gnathopod one subchelate; gnathopod two subchelate or chelate. Peraeopods three through six short; peraeopod seven elongate. Uropods slender, biramous. Telson small, entire.

FAMILY HAUSTOIIDAE (Figure 160)

Definition: Body broad, smooth. Urosome may be spinose or setose. Antenna one with accessory flagellum is shorter than antennae two. Gnathopods one and two subchelate, simple or minutely chelate. Peraeopods five, six and seven modified for burrowing; peraeopod six longest. Uropods usually biramous; uropod three different from one and two. Telson small, normally cleft.

FAMILY ARGISSIDAE (Figure 161)

Definition: Body slender, smooth. Segments of peraeon short, deep. Coxa one, two and three decrease in size; coxa four large. Head short. Antennae two longer than antennae one, accessory flagellum present. Coxas five, six and seven with large posterior lobe; coxas four largest. Gnathopods simple or sub- chelate. Peraeopods three and four weak; five, six and seven, larger, subequal. Uropods biramous. Telson cleft.

FAMILY PHOXOCEPHALIDAE (Figures 162-163)

Definition: With a smooth fusiform body. Coxa deep, fourth largest, margins bearing setae. A broad rostrum overhangs base of antennae. First antennae short, with accessory flagellum. Male and female dimorphic. Antennae two with elongate flagellum. Gnathopods subchelate or chelate. Peraeopod six longest, seven short. Basis of peraeopods six and seven expanded. Uropods biramous, spinose. Telson cleft.

FAMILY ATYLIDAE (Figure 164)

Definition: Body much compressed. Urosome with carina; and with segments two and three united. Rostrum prominent, eyes located laterally. Accessory flagellum small or lacking. Gnathopods subchelate, subequal, sexually dimorphic. Peraeopod three larger than four. Uropod two shorter than one. Telson cleft.

FAMILY AMPELISCIDAE (Figures 165-166)

Definition: Body smooth, head longer than deep. Usually four eyes. Second antennae longer than first. Coxal plates deep, lower margins setose. Gnathopods simple or subchelate. Dactyls of pereaopods three and four elongate; dactyls of five and six short. Peraeopod seven shortest, different from five and six. Uropod three lanceolate, foliaceous.

FAMILY LYSIANASSIDAE (Figure 167)

Definition: Body deep, subfusiform. First four coxal plates large, deep; fourth coxa with a distal posterior protrusion. Coxa five, six and seven deep. Head small; eyes large. Antennae one short, first peduncle segment inflated; accessory flagellum large. Antennae two slender; short in female, long in male. First gnathopod simple, chelate or subchelate; second gnathopod slender chelate or subchelate. Peraeopods five, six and seven subequal or successively longer. Uropods biramous. Telson deeply cleft.

FAMILY AORIDAE (Figures 168-171)

Definition: Body slender, smooth, depressed. Coxa medium or small; coxa one largest, produced anteriorly; coxa five with a deep anterior lobe. Head blunt, rostrum short. Antennae one longer than antennae two; accessory flagellum usually present. Gnathopod one and antennae two sexually dimorphic. Gnathopods subchelate; gnathopod one larger in males. Seventh peraeopod longest. Uropods slender, usually biramous. Telson short, entire.

FAMILY AMPITHOIDAE (Figure 172)

Definition: Body smooth, not strongly laterally flattened. Pronounced sexual dimorphism. Coxae deep; smooth or setose distally. Fourth and fifth coxae largest. Eyes rounded on a short anterior lobe. Antennae longer than antennae two; accessory flagallum short or lacking. Gnathopods strongly subchelate, second usually larger. The uropods are biramous; rami of uropod three are shorter than peduncle.

FAMILY AMPHILOCHIDAE (Figure 173)

Definition: Accessory flagellum absent. Head with a conspicuous rostrum. Coxa one is very small, partially hidden by following coxae; coxae two sometimes as small as coxa one, or as large as three. Coxae three and four enlarged. Gnathopods subchelate or simple, small to medium size. Telson entire. Uropods three biramous.

FAMILY COROPHIIDAE (Figures 174-178)

Definition: Urosome depressed, body smooth; coxae short, shallow. Head short with a prominent eye lobe. Antennae one equal to or shorter than antennae two; accessory flagellum lacking. Gnathopod one subchelate; gnathopod two subchelate or simple, larger than one. Pleopods short, stout. Uropod three short, usually uniramous. Telson short, broad.

GENUS *Corophium* (Figures 175-177)

Body very depressed. Coxae small, separated. Anterior laobes of head prominent, with eyes. Antennae two longer than antennae one. Peduncular segments of antennae two, stout. Gnathopod one weakly subchelate; gnathopod two simple. Peraeopods five and six short; peraeopod seven long. Pleonal side plates small, separated; pleopods short. Uropods one and two biramous, uropod three uniramous. Telson broad, small.

Three species of *Corophium* were recovered from Tampa Bay. They may be new species or subspecies of those they closely resemble.

FAMILY PODOCERIDAE (Figure 179)

Definition: Body depressed, slender. Coxae small, separated. Gnathopods sexually dimorphic. Antennae elongate, strongly setose posteriorly. Accessory flagellum present, reduced, or lacking. Gnathopods one and two usually subchelate. Gnathopod two largest. Peraeopods five, six and seven increasing in length. Urosome one elongate; urosome three small or fused with two. Uropods one and two biramous. Uropod three abnormal, reduced or lacking. Telson small, oval.

ORDER DECAPODA (Figures 181-182)

Definition: Malacostracan crustaceans in which the first three pairs of thoracic appendages are modified as maxillipeds; and the remaining five pairs of thoracic appendages are legs, the first pair which often is modified as a cheliped. The legs are usually without exopodites. The head is fused with the thoracic segments dorsally and the gills are enclosed in lateral branchial chambers formed by the overhanding carapace.

The Decapoda are traditionally divided into two suborders: The Natantia, shrimps (Figure 181); and the Reptantia, lobsters, crayfish and crabs (Figure 182).

SUBORDER NATANTIA (Figures 180-181; 183-192)

Definition: Body laterally compressed. Rostrum normally laterally compressed and serrated. Antennules usually with a stylocerite. Antennal scales large and flattened. Legs slender, similar except when any of the first three pairs are chelate or subchelate. All the abdominal segments bear pleopods which are well developed and used for swimming. The first abdominal segment equal or slightly subequal to the rest.

FAMILY PENAEIDAE (Figure 180)

Definition: Shrimplike crustaceans. Well developed rostrum usually with teeth. The first three pairs of thoracic appendages are chelate; all thoracic appendages slender. Eyes variously elongate. Antennules with two flagella. Pleura of the second abdominal segment does not overlap the pleura of the first abdominal segments.

FAMILY SERGESTIDAE (Figure 183)

Definition: Penaeids in which the last two pairs of thoracic appendages (legs) are reduced or lost and the gills are few or lost.

FAMILY PALAEMONIDAE (Figure 184)

Definition: The first two pairs of legs are chelate; the second pair usually larger than the first; carpus of the second pair not divided. Rostrum usually toothed; mandible usually with an incisor process. The pleura of the second abdominal segment overlaps the pleura of the first and third segments.

FAMILY ALPHEIDAE (Figures 185-188)

Definition: Carapace smooth, usually projecting over eyes. Rostrum reduced; antennal and branchiostegal spines absent. Base of antennae cylindrical, shorter than combined length of other two articles. Antennal scale seldom longer than peduncle. Chela of first pair of legs, large; carpus short. Second legs weakly developed; the propodi of the third to fifth pair of legs are spinous; the dactyls simple or bifurcate.

FAMILY OGYRIDIDAE (Figure 189)

Definition: Pleura of second abdominal segment overlaps the pleura of the first and third segments. First two pairs of legs chelate, nearly equal and only slightly larger than other legs. Second pair of legs with a subdivided carpus. Rostrum small or absent. Eyestalks long. Telson heavy, blades or uropods curved outward.

FAMILY HIPPOLYTIDAE (Figure 190)

Definition: Pleura of second abdominal segment overlaps the pleura of the first and third segments. First two pair of legs chelate; carpus of the second pair subdivided. Eyes not covered by carapace. Mandibles cleft; second maxillipeds have a very short dactyl.

FAMILY PROCESSIDAE (Figures 191-192)

Definition: Smooth body, short rostrum. First pair of legs chelate, asymmetrical; second pair minutely chelate. Eyes large; well developed cornea. Antennule peduncle with well-developed stylocerite. Antennal scale well developed.

SUBORDER REPTANTIA (Figures 182; 193-204)

Definition: Lobsterlike or crablike in form. Cephalothorax depressed; rostrum small or absent; stylocerite absent. Legs strong, first pair may be larger than the others. Abdomen usually depressed; first abdominal segment smallest; pleopods reduced or absent.

FAMILY CALLIANASSIDAE (Figure 193)

Definition: Body shrimplike. Peduncle of antennae five-jointed. Antennal scale reduced, vestigial. First pair of legs unequal, chelate; third and fourth pair of legs simple, third and fifth variable. Pleura small or absent. Telson and uropods well developed, broad. Abdominal segments 3-6 with broad appendages.

FAMILY PORCELLANIDAE (Figures 194-195)

Definition: Crablike appearance; carapace depressed, well calcified. Rostrum short; antennae inserted lateral to eyes, consisting of three movable segments and a flagellum. Basal articles of antennules broad. Chelipeds elongate, broad, flattened. First three legs well developed, but leg smaller, folded against carapace. Abdomen broad, seven segments, folded under thorax.

FAMILY PAGURIDAE (Hermit crabs) (Figure 196)

Definition: Abdomen soft, spirally coiled in modification to occupation of gastropod shells. Carapace elongate broadened posteriorly. Eyes stalked. Antennal peduncle five jointed. First pair of legs, large, chelate; fourth and fifth pair reduced, modified. Abdominal appendages usually present only on left side.

Most of the invertebrates presented in this manual are components of the benthic infauna. The hermit crabs, however, would be considered a component of the epifauna; that is, they crawl about on the surface of the sediments in search of food. Adult specimens of the family Paguridae were seldom collected with remote sampling gear.

FAMILY ALBUNEIDAE (Figure 197)

Definition: Carapace flattened, not covering legs. First pair of legs subchelate. Rostrum reduced or absent. Abdomen reduced, bent under thorax. Telson nearly oval in shape.

FAMILY LEUCOSIIDAE (Figure 198)

Definition: Crabs with a circular, oval or polygonal carapace. Eyes small, frontal margin narrow. Antennae small; antennules fold obliquely. Maxilliped enclose a buccal cavity. Chelipeds symmetrical. Abdomen folded beneath thorax.

FAMILY XANTHIDAE (Figures 199-201)

Definition: Body transversely oval or hexagonal. Front broad without a rostrum. Last pair of legs normal, usually similar to pairs 2-4. Antennules fold obliquely or transversely.

FAMILY PINNOTHERIDAE (Figures 202-204)

Definition: Carapace may be membranous; anterolateral margins lacking or with minor dentations. Orbits and eyestalks small. Buccal cavity wide. Merus of third maxilliped not quadrate, without palp; ischium small.

Pinnotherids are generally small, living as commensals or parasites with or on other invertebrates.

CLASS CRUSTACEA SUBCLASS CEPHALOCARIDA

ORDER REMITEDIA

FAMILY LIGHTIELLIDAE

Fig. 121. Lightiella floridana - McLaughlin, 1976. To about 2.5 mm in length. The eighth thoracic segment lacks appendages. The telson is the only abdominal segment with a vertical comb. Telson with dorsal terminal spines. Pleura of eighth thoracic segment, a small spinose process, pleura of pretelsonic segments moderately strong spinose processes. Pleura of first seven thoracic segments broadly rounded. Caudal rami equal or exceed telson width, usually as long as the last two abdominal segments. For a more detailed taxonomic description, see McLaughlin, 1976.

SUBCLASS OSTRACODA ORDER PODOCOPIDA

FAMILY CYTHERIDEIDAE - Sars, 1925

Fig. 122. Haplocytherida setipunctata - Brady, 1969. Carapace thick heavily calcified, ovate in lateral view. Surface of valves pitted. Shells translucent. This species was often collected in large numbers. Valves often remain attached after animal is dead.

ORDER MYODOCOPINA

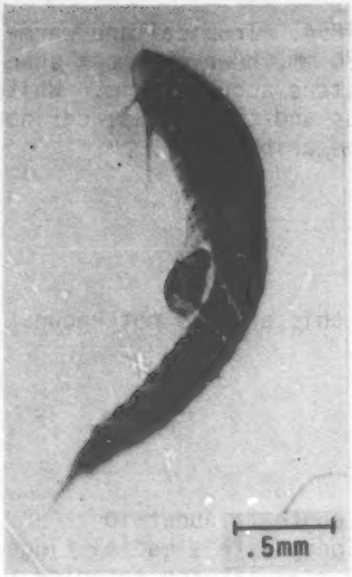
FAMILY CYLINDROLEBERIDIDAE - Muller, 1906

Fig. 123. Parasterope pollex - Kornicker, 1967. Carapace thin, flexible, semitransparent, oval in lateral view. Thumblike anterior dorsal process. Antennae of male about as long or longer than carapace. This species also occasionally occurred in large numbers.

FAMILY SARSIELLIDAE - Brady & Norman, 1896

Fig. 124. Sarsiella zostericola - Cushman, 1906. Female: Dorsal view; carapace broadly rounded at posterior, narrowing anteriorly. Lateral view; oval with a posterior ventral process. Surface of valves with 3 raised ribs radiating from a point slightly forward of center. Male: Symmetrical in dorsal view with a sharp caudal process on each valve. Suboval in lateral view with a shallow anterior sinus beneath the rostrum and a short knoblike posterior ventral projection. Three raised ribs laterally as in female but with the posterior rib projecting more dorsally. Carapace of both males and females undergoes gradual morphological changes during growth.

PLATE 25 (Figures 121-124)



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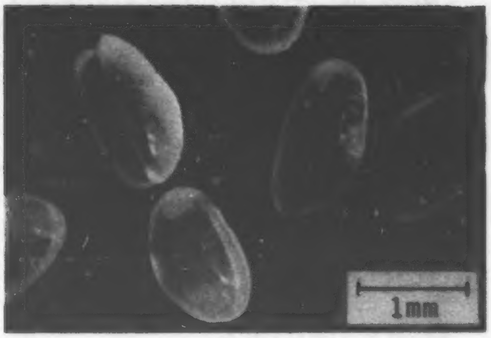

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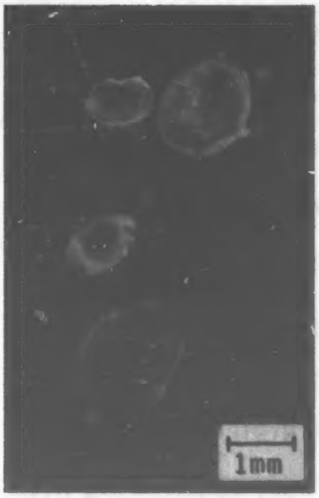

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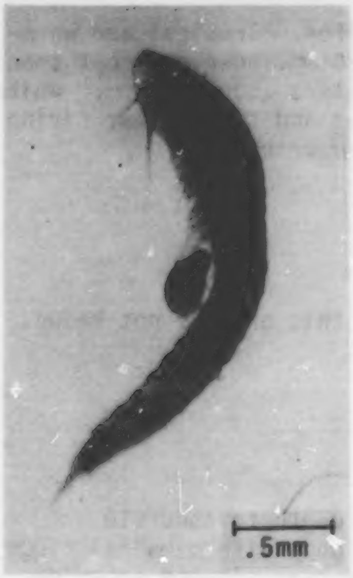
PLATE 25 (Figures 121-124)



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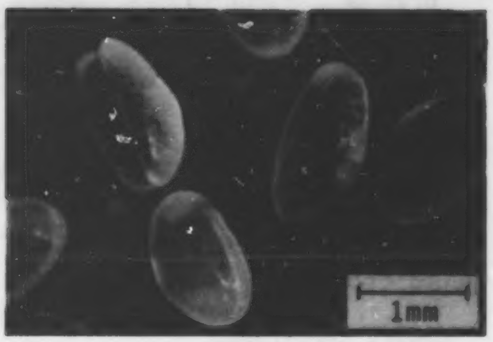

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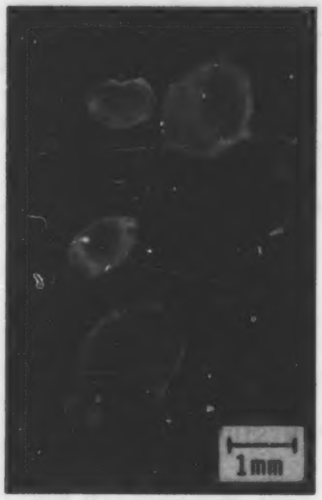

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SUBCLASS CIRRIPEDIA

ORDER THORACICA

FAMILY BALANIDAE

Fig. 125. Balanus amphitrite - Darwin, 1854. Tropical and warm-temperature seas. Base diameter up to 20 mm, however, most specimens collected were juveniles with base diameters about 2-4 mm. White with gray or lavender lines. Basis calcareous and tubiferous; carina tubiferous. Many subspecies have been described.

SUBCLASS MALACOSTRACA

ORDER NEBALIACEA

Fig. 126. Nebalia sp. - The species for this area is not known. Relatively few specimens were collected.

ORDER STOMATOPODA

FAMILY SQUILLIDAE

Fig. 127. Squilla empusa - Say, 1818. Length to about 10 centimeters. Rostral plate wider than long, with a medial ridge. Medial ridge of carapace bifid between dorsal pit and anterior margin. Raptorial dactylus with six teeth. Fifth thoracic somite with a sharp lateral spine curved anteriorly; sixth and seventh thoracic somites with acute lateral processes. Telson with 3-5 submedian denticles, 6-9 intermediate denticles, and one lateral denticle.

ORDER MYSIDACEA

Fig. 128. Statocyst

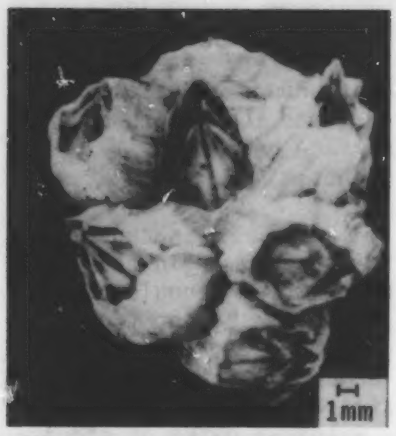
Fig. 129. Brood pouch

SUBORDER MYSIDA

FAMILY MYSIDAE

Fig. 130. Bowmaniella dissimilis - Coifmann, 1937. Delaware to Brazil. Length to about 9mm. Carapace with a narrow triangular rostrum. Antennal scale length about 3.5 times width, with a small tooth on the outer distal corner and the outer margin naked. Antennule peduncle segment one is long, equal to combined length of segments two and three. Abdominal segment five with a posterior dorsal scale. The uropods are longer than the telson with the exopods longer than the endopods. Outer margin of exopod with 18-20 spines, endopod with 5-6 submarginal spines on inner edge. The telson is cleft with 6-8 lateral spines and 2 long apical spines; cleft with 13-15 small denticles.

PLATE 26 (Figures 125-130)



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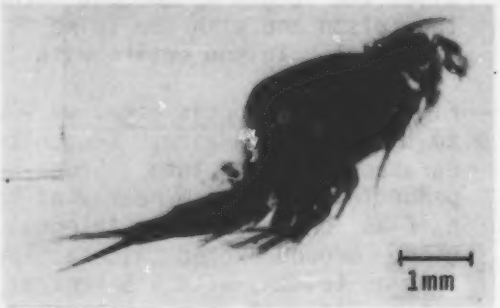

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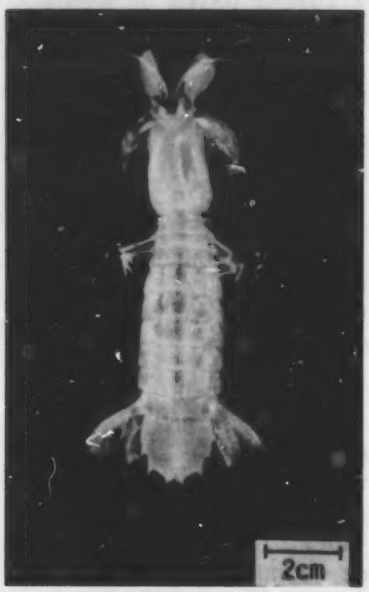

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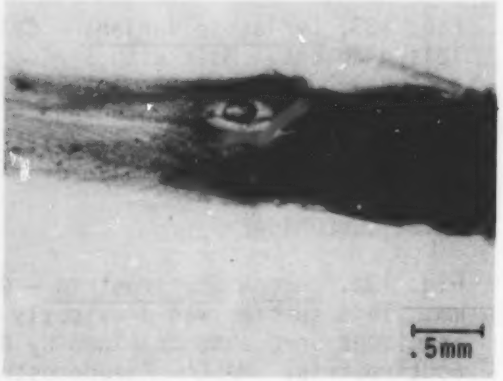

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Fig. 131. *Mysidopsis almyra* - Bowman, 1964. Louisiana to Florida. Length to about 7mm. Anterior margin of carapace rounded, not covering base of eyestalks. Lanceolate, outwardly curved antennal scale; about 6 times longer than wide. Exopod of uropod about 1.4 times the length of endopod. Endopod about 1.3 times the length of the telson and with one spine on the ventral surface near the statocyst. Telson entire with 13-20 lateral spines.

Fig. 132. *Mysidopsis bigelowi* - W. M. Tattersall, 1926. Massachusetts to the Gulf of Mexico. Length to about 8 mm. Anterior margin of carapace produced into a broad subtriangular rostrum. Antennule peduncle segment one nearly as long as segment three: segment two half as long as three. Antennal scale setose six times as long as wide. Uropod exopod twice as long as telson; endopod 1.5 times as long as telson, with 4-5 ventral spines near statocyst. Telson entire, lateral margin with 10-13 spines, apex with 2-3 pairs of stout spines.

ORDER CUMACEA

FAMILY BODOTRIIDAE

Fig. 133. *Cyclaspis varians* - Calman, 1912. Maximum length 3-4 mm. Telson absent. Male with 5 pleopods. Pseudorostrum acute, wide antennal notch; and the antennal tooth acute in females, rounded in males. A single pigmented eye (fused eyes) located medially. Surface of carapage smooth, usually spotted with pigment. Inner rami with only one segment. Antennae of mature males reach to telson.

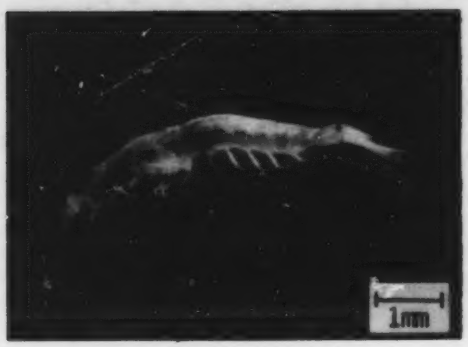
FAMILY LEUCONIDAE

Fig. 134. *Leucon acutirostris* - G. O. Sars, 1865. Length of about 3.5 mm. This species was previously recorded from the Arctic and Norway. Specimens were also examined by Dr. M. Bacescu and confirmed as *L. acutirostris*. MALE: Pseudorostral projection short. Carapace smooth dorsally, anterolateral margins about a 90 degree rounded angle, serrated below. FEMALE: Pseudorostral projection longer than male, terminally acute. Anterior portion of carapace with a dorsal serrated crest. Lower anterolateral margin of carapace produced, serrated. Inner ramus of uropoda (for both sexes) shorter than outer ramus, its distal segment about half the length of the proximal segment.

FAMILY NANNASTACIDAE

Fig. 135. *Cumella garriti* - Bacescu and Murandian, 1977. To about 3 mm in length. MALE: With carapace less than one-third total length; no pleopods (characteriscis of *Cumella*); pseudorostrum short. FEMALE: Anterolateral angle of carapace bearing a series of serrations; pseudorostrum longer, more acute than male.

PLATE 27 (Figures 131-135)



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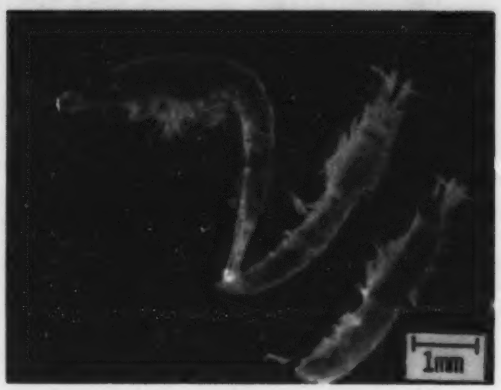

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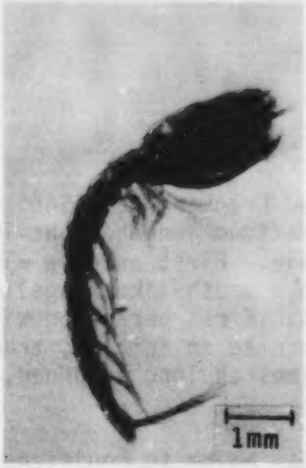

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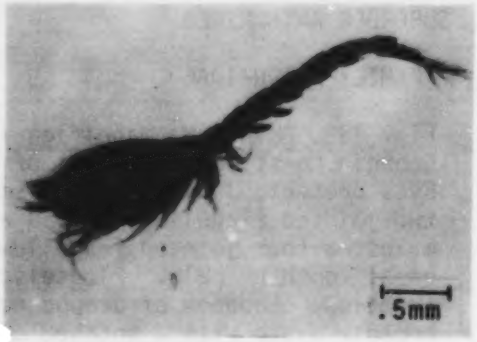

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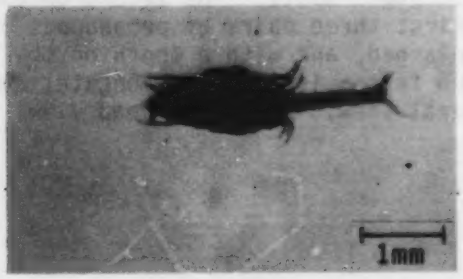

135

FAMILY DIASTYLIDAE

Fig. 136. Oxyurostylis smithi - Calman, 1912. Reaches a maximum length of about 7 mm. As seen from the side, the dorsal edge of the carapace is arched, sloping posteriorly and anteriorly to the short horizontal pseudorostrum. Antennal notch lacking. There is a prominent pointed telson. Eyes are indistinct; there is no occular pigment. In the female, there are two parallel, oblique ridges on both sides of the carapace which are united at the lower edge; the upper ends are connected by a short longitudinal ridge. Anterior to these are several short transverse ridges and a lateral ridge passing by the side of the pseudorostrum. The male is similar in appearance with only 2 transverse frontal ridges and with an additional ridge along the ventral margin to the posterior ridge. The antennae of mature males are as long as the entire animal. The first and second pair of pleopods are biramous and larger than the last 3 pairs.

ORDER TANAIDACEA

Fig. 137. Tanaidacea taken from Tampa Bay.

ORDER ISOPODA

SUBORDER ANTHURIDEA

FAMILY ANTHURIDAE

Fig. 138. Apanthura magnifica - Menzies and Frankenberg, 1966. Georgia Coast to West Coast of Florida. Maximum length about 10 mm. Eyes present; large in male, small in female. First antenna with a two-jointed flagellum; second antenna with a brush-like flagellum in males, a four-jointed flagellum in females. First peraeopod with a basal tooth on palm. Pleotelson ovate; pointed in females, truncate in males. Endopod of uropod nearly two times as long as broad, exopod broadly ovate with a notched apex.

Fig. 139. Cyathura polita - Stimpson, 1856. Maine to Louisiana. Length to about 25 mm. Body narrow, elongate, about seven times longer than wide. Eyes small. The second antennae are longer than the first. The first three pairs of peraeopods are prehensile with the first pair enlarged, and with a tooth on the interior margin of the propodus. The telson is narrow, elongate, and terminally rounded. A. Lateral view. B. Dorsal head view.

PLATE 28 (Figures 136-139)

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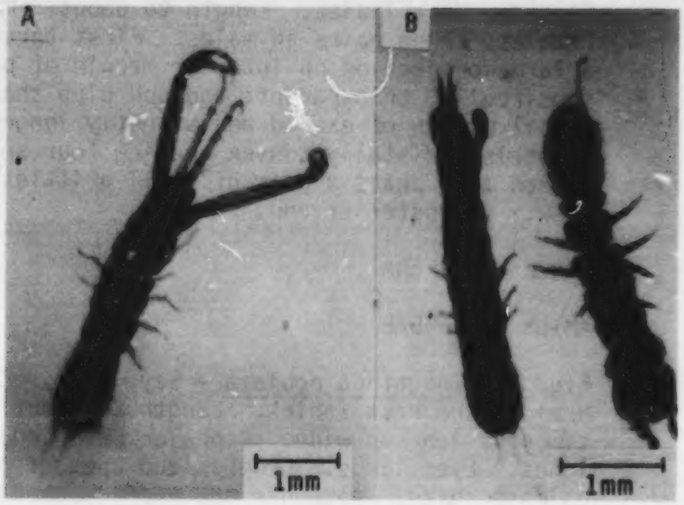

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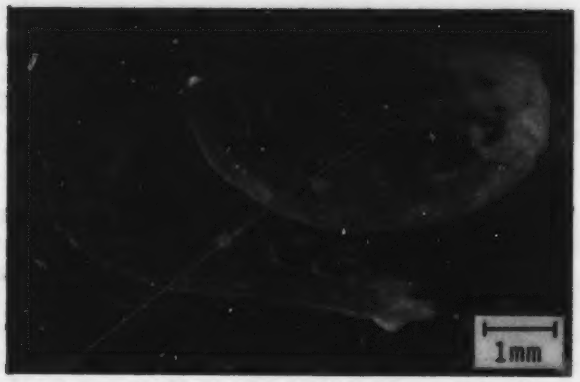

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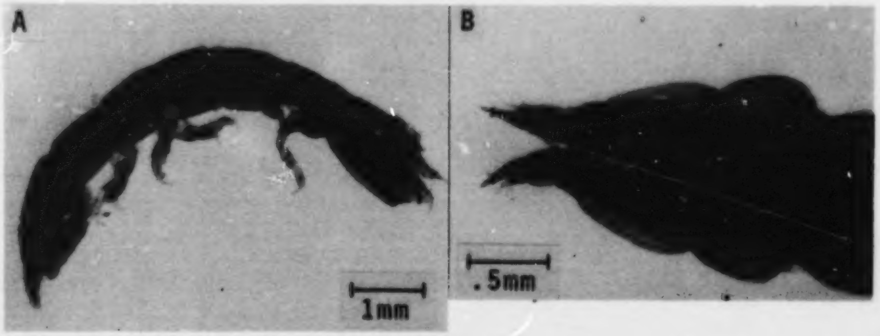

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Fig. 140. *Xenanthura brevitelson* - Barnard, 1925. Georgia coast, Florida, West Indies. Length to about 5 mm. One pair of eyes in females, three pairs in males. First three peraeopods subchelate with a large projection on interior margin of palms. Exopods of uropods subcircular, transparent; endopod club-shaped extending beyond the apical margin of exopod and slightly longer than the telson. Pleotelson distally convex bearing four setae, the inner two swollen. Telson also bears a pair of small bristles near apex. A. Lateral view. B. Posterior end.

SUBORDER VALVIFERA

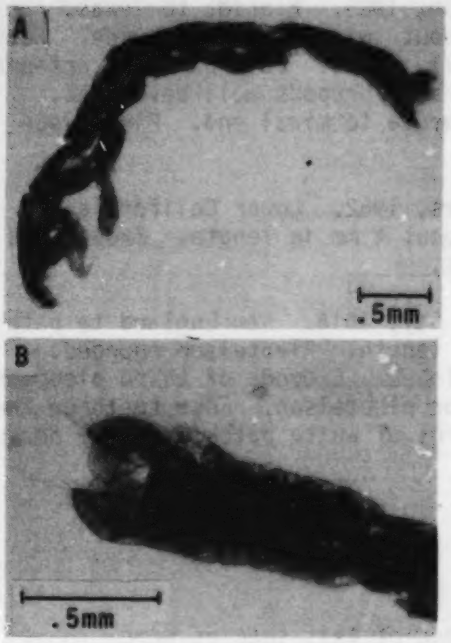
FAMILY IDOTEIDAE

Fig. 141. *Aegathoa oculata* - Say, 1818. Connecticut to Yucatan, Mexico; the West Indies. Length to about 11 mm. Body elongate, four times as long as wide. Cephalon produced posteriorly into three lobes. Eyes large. Uropods and apex of pleotelson with fringe of pulmose setae. Antennae one are composed of eight articles; antennae two composed of ten articles, slightly longer than antennae one. Peraeopods are prehensile with long, narrow, curved dactyli.

Fig. 142. *Edotea montosa* - Stimpson, 1853. Nova Scotia to Florida. Length to about 9 mm. Body ovate, depressed, more than twice as long as wide. Lateral margins of peraeonal somites rounded. First pair of antennae extend to the middle of last peduncular article of second antennae. The third and fourth thoracic segments are the longest and widest.

Fig. 143. *Erichsonella filiformis isabelensis* - Menzies, 1951. Florida to Texas. Length to about 12 mm. A small bump medially on the cephalon. Two small tubercles found on the frontal cephalic margin of *E. filiformis* are lacking. The supralateral extension of the second paraeonal somite does not extend beyond the lateral margin. Mid-lateral pleotelson extension reduced to a small protuberance. Width of Pleotelson less than one-half length.

PLATE 29 (Figures 140-143)



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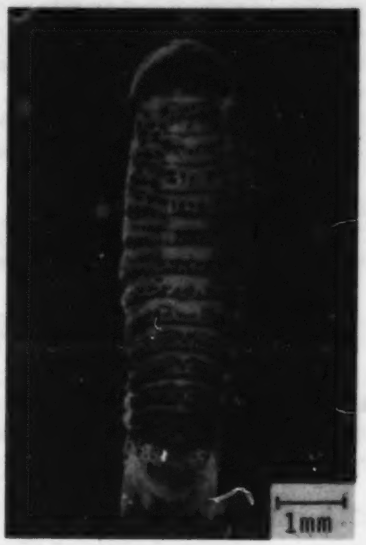

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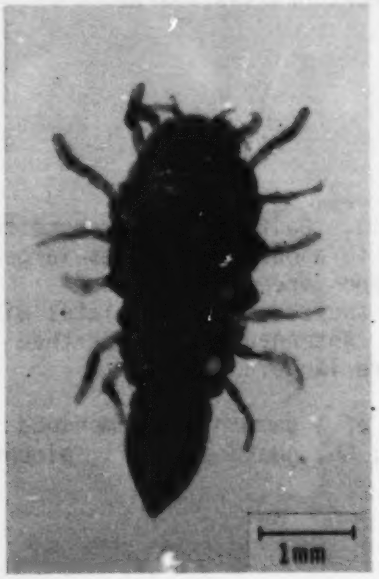

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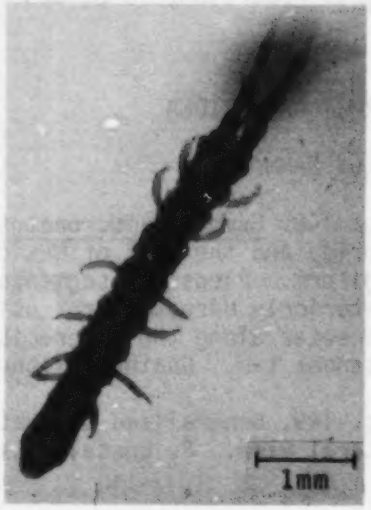

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FAMILY SPHAEROMIDAE

Fig. 144. *Cymodoce faxoni* - Richardson, 1905. Florida to Texas. Length to about 6 mm. Body ovate, about twice as long as wide. Head two times as wide as long. Eyes small, round. Both pairs of antennae long, second slightly longer than first. Uropods well developed, exopod longer than endopod, with an acute terminal end. Pleotelson with two medially-located tubercles.

Fig. 145. *Dynamenella dianae* - Menzies, 1962. Lower California, Mexico, Puerto Rico (Florida). To about 4 mm in length. Exopod and endopod, large with crenulate margins.

Fig. 146. *Sphaeroma quadridentatum* - Say, 1818. New England to both sides of Florida. To about 10 mm in length. Pleotelson rounded. Maxillipedal palps with conspicuous lobes. Exopods of third pleopods not jointed. No tubercles on pleon or pleotelson. Four teeth on the exopod of the uropod. Various patterns of white patches on the dorsum are common.

SUBORDER ASELLOTA

FAMILY MUNNIDAE

Fig. 147. *Munna* sp. Very few specimens of this species were collected. The identity of these specimens which are very small (0.5 - 1.0 mm) was not confirmed. These specimens could possibly be *Munna hayesi* Robertson, 1978, described from Port Aransis, Texas.

ORDER AMPHIPODA

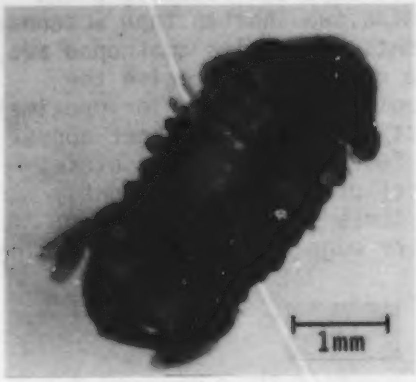
SUBORDER GAMMARIDEA

FAMILY GAMMARIDAE

Fig. 148. *Gammarus mucronatus* - Say, 1818. Gulf of St. Lawrence to Florida and the Gulf of Mexico. Length to about 5 mm. Eyes large, reniform. Pleosomal segments one, two and three with a sharp posteriorly directed protrusion. First and second coxal plates with 4-8 setae along the anterodistal angle. Antennae one longer than antennae two. Gnathopods one and two are large.

Fig. 149. Generalized schematic drawing of a gammaridean amphipod in lateral view. B, buccal mass; C. coxae; Gn, gnathopods; Pl, pleopods.

PLATE 30 (Figures 144-149)



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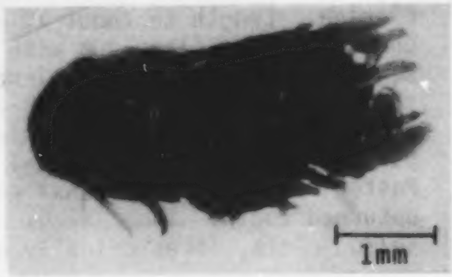

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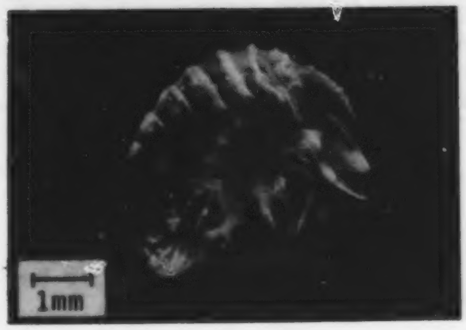

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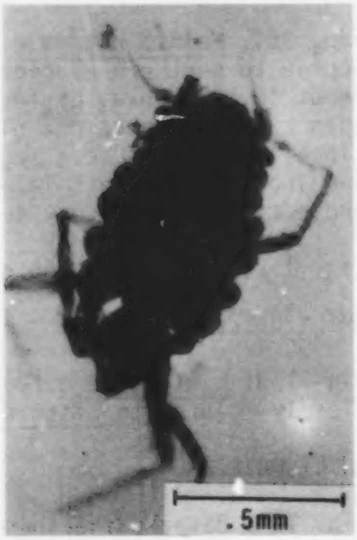

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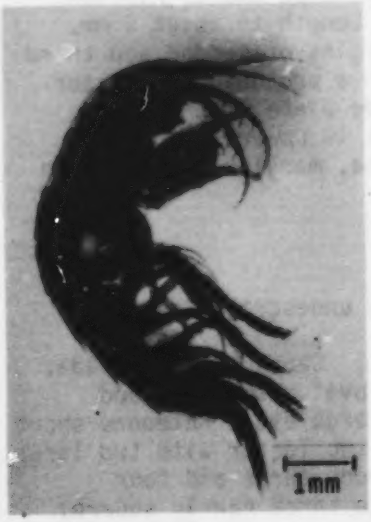

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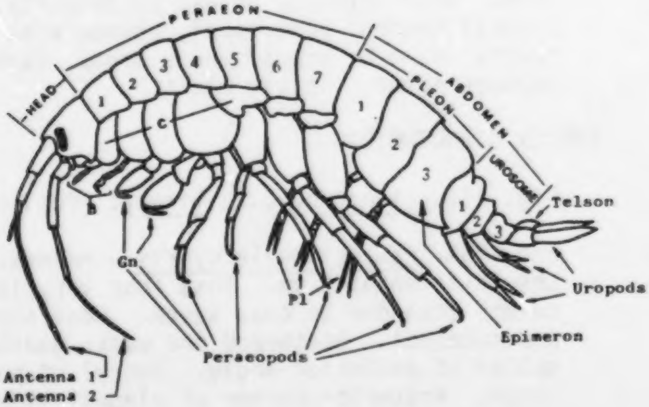

PERAEON
HEAD
1
2
3
4
5
6
7
C
PLEON
ABDOMEN
1
2
3
UROSOME
1
2
3
Telson
B
Gn
Pl
Uropods
Epimeron
Peraeopods
Antenna 1
Antenna 2

149

Fig. 150. Elasmopus levis - Smith, 1873. Cape Cod to Georgia and Florida. Length to about 10 mm. Antennae two shorter than antennae one; accessory flagellum with 2-3 segments. In males gnathopod two, segment six is ovate, the inner surface excavate to receive the strongly curved dactyl; with a stout tooth at the posterior proximal edge of excavation. In females the dactyl closes on a short convex palm. Margins or peraeopodal segments four, five and six setose. Posterior corner of pleonal segment three produced in a slightly upturned tooth. Inner ramus of uropod three shorter than outer. Telson cleft, lobes apically acute; outer edge each with three spines.

FAMILY MELITIDAE

Fig. 151. Melita nitida - Smith, 1873. Gulf of St. Lawrence; Nova Scotia to Northern Florida; Gulf of Mexico to Yucatan. Length to about 10 mm. Coxal plates large, angles rounded. Antennae one longer than two. Antennae one flagellum with whorls of setae; antennae two flagellum and peduncle segment 5 with whorls of longer setae. Pleonal and urosomal segments lack mucronations (dorsal teeth or spinelike projections). Terminal segment of exopod of uropod three minute.

Fig. 152. Melita sp. An undescribed species.

FAMILY LILJEBORGIIDAE

Fig. 153. Listriella c.f. barnardi - This species also appears to be closely related to Listriella quintana McKinney, 1979.

FAMILY BATEIDAE

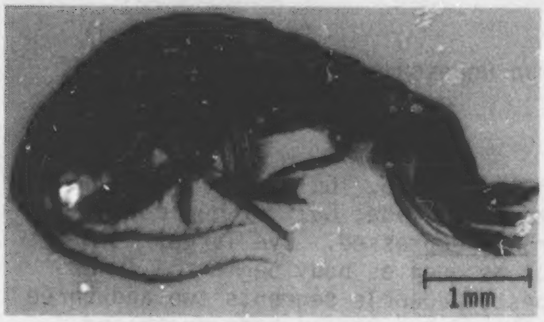
Fig. 154. Batea catharinensis - Muller, 1865. Cape Cod to Florida; Gulf of Mexico; Caribbean region to Brazil. Length to about 6 mm. With an acute down curved rostrum. Lower margins of second and third coxal plates convex, rounded. Coxa four with a protuding posterior lobe. Both antennae setose posteriorly. Side plate of the third pleonal segment posteriorly convex with about 10 upward pointing teeth. Rami of uropod three broad, lanceolate, margins spinose with pulmose setae. Telson cleft.

FAMILY STENOTHOIDAE

Fig. 155. Stenothoe c.f. minuta. Possibly an undescribed species.

Fig. 156. Parametopella cypris - Holmes, 1905. Cape Cod to Florida. Length to about 2 mm. Coxa four very large, oval extends to and covers coxa one to coxa seven. Head short; large eye. Antennae short and subequal. Gnathopod one weak; gnathopod two larger with two large spines at posterior angle. Dactyl of peraeopods three and four large. Posterior corner of pleonal side plate three nearly square. Telson long, ovate.

PLATE 31 (Figures 150-156)



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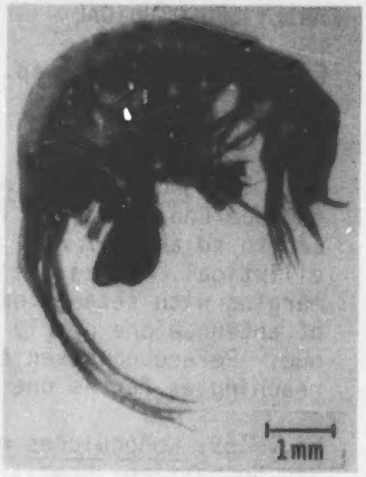

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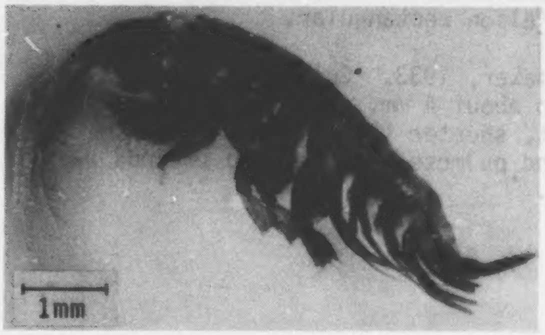

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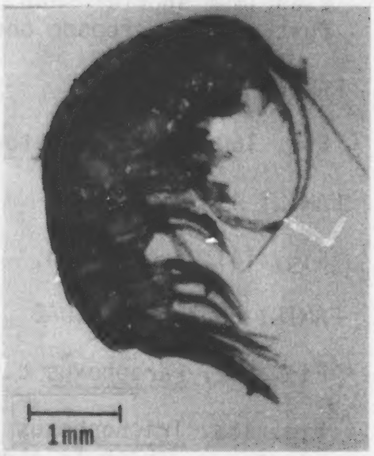

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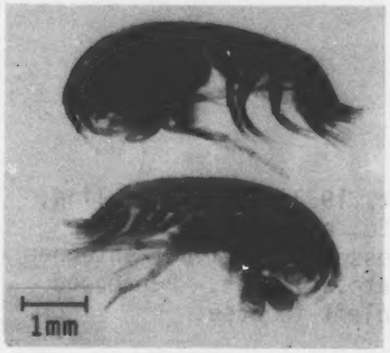

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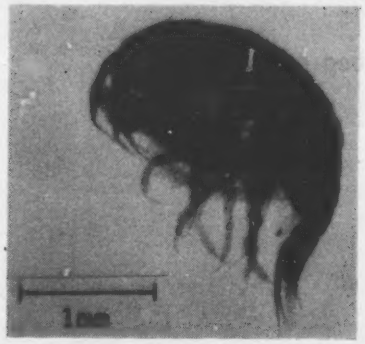

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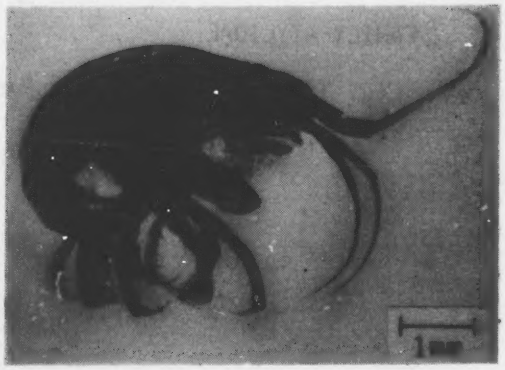

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FAMILY LEUCOTHOIDAE

Fig. 157. *Leucothoe* sp. Possibly an undescribed species.

FAMILY OEDICEROTIDAE

Fig. 158. *Monoculodes edwardsi* - Holmes, 1905. Gulf of St. Lawrence to Cape Cod; Middle Atlantic states to Florida; Gulf of Mexico. Length to about 7 mm. Rostrum strong, depressed. Eye large, elliptical. Coxae one through four as deep as body segments, lower margins with setae; coxa five deepest, peduncle segments two and three of antennae one nearly equal. Gnathopod two larger than gnathopod one. Peraeopod seven extends beyond uropods. Uropod three not reaching as far as one and two. Telson rectangular.

Fig. 159. *Monoculodes nyei* - Shoemaker, 1933. Gulf of Mexico; Illha Sao Sesbastiao, Brazil. Length to about 4 mm. Very similar to *M. edwardsi*. Antennae one very short, shorter than *M. edwardsi*, flagellum shorter than peduncle and pulmose. Uropod two extends back further than uropods one or three.

FAMILY HAUSTORIIDAE

Fig. 160. *Acanthohaustorius* sp.

FAMILY ARGISSIDAE

Fig. 161. *Argissa* sp.

FAMILY PHOXOCEPHALIDAE

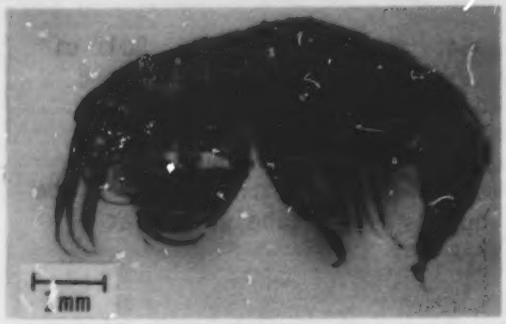
Fig. 162. *Paraphoxus* c.f. *spinosus*

Fig. 163. *Trichophoxus floridanus* - Shoemaker, 1933. South Carolina; Florida. Length to about 6 mm. Head elongate; a long, spatulate rostrum. Antennae one short with a long accessory flagellum; antennae two nearly as long as body. Gnathopods chelate, similar. Peraeopod six longest. Uropod three spinose. Telson cleft to base.

FAMILY ATYLIDAE

Fig. 164. *Nototropus* sp. Possibly an undescribed species.

PLATE 32 (Figures 157-164)



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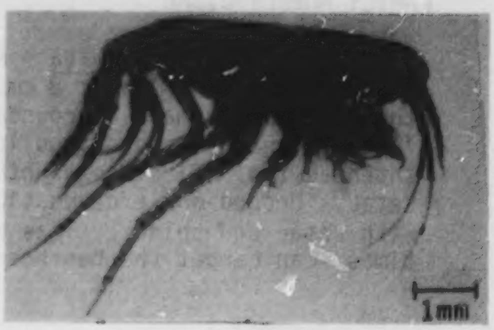

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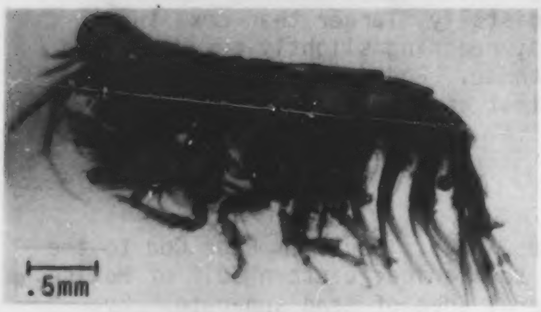

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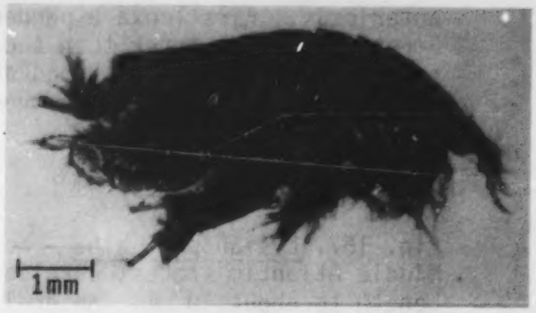

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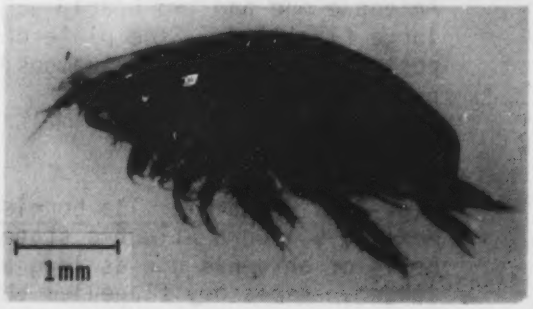

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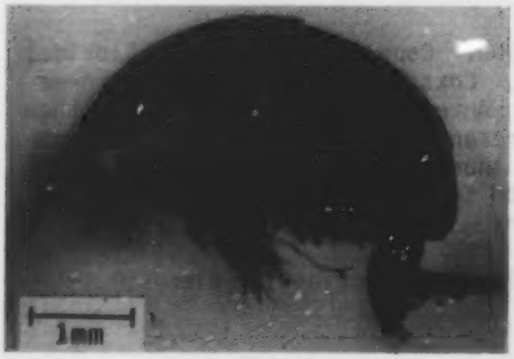

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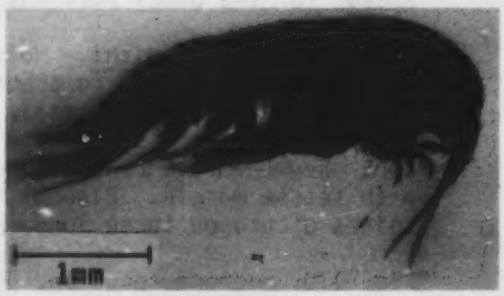

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FAMILY AMPELISCIDAE

Fig. 165. Ampelisca abdita - Mills, 1964. Maine to Florida; Gulf of Mexico. Length to about 8 mm. Urosome one dorsally flat; urosome three posterior margins rounded. Head elongate. Antennae two longest; antennae one flagellum extends just beyond peduncle of antennae two. First coxa anteroventrally rounded, fringed with setae. Uropod one exceeds tip of uropod two; uropod three lanceolate with setae and spines. This species builds a mud tube which, at times, can carpet the benthos in thick mats.

Fig. 166. Ampelisca holmesii - Pearse, 1908. Rhode Island to Florida; Gulf of Mexico. Length to about 10 mm. Head elongate, tapering anteriorly. First coxa expanded distally, larger than coxa two. First antennae shorter then second, reaching slightly beyond second segment of peduncle of second antennae. Peduncle of second antennae elongate; noticeably longer than that of A. abdita. This species is also a tube builder.

FAMILY LYSIANASSIDAE

Fig. 167. Lysianopsis alba - Holmes, 1905. South of Cape Cod to the Middle Atlantic states; Carolinas to Florida; eastern Gulf of Mexico. Length to about 10 mm. Anterolateral lobe of head subacute. Eye oval. Coxa rectangular; coxa four protrudes posteriodistally. Antennae one and two nearly equal; one with enlarged basal segment and large flagellum. Side plate of pleonal segment three evenly rounded posteriorly. Uropods biramous; outer ramus longer than inner. Telson nearly as wide as long.

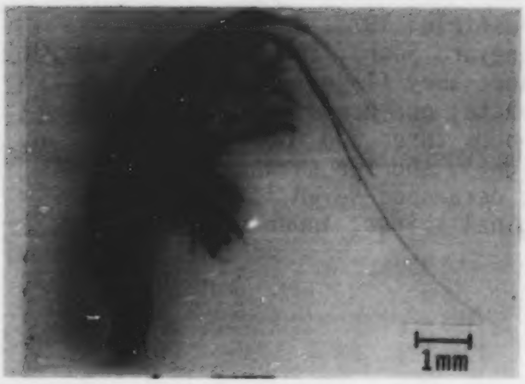
FAMILY AORIDAE

Fig. 168. Grandidierella bonnieroides - Stephensen, 1948. Gulf of Mexico; southern Atlantic states; West Indies. Length to about 8 mm. Basis of antennae one as long as head; second segment slightly longer. Accessory flagellum absent. Antennae two shorter than one. Fifth segment of gnathopod one enlarged, twice as long as wide with one to three spines on the poasterior margin. During collection and preservation, specimens of G. bonnieroides tend to lose their antennae except for the basal portions.

Fig. 169. Lembos smithi - Holmes, 1905. Cape Cod to Northern Florida; Buzzards Bay. Length to about 5 mm. Coxae shallow; coxae two, three and four setose. Eyes small, oval. Antennae one slightly longer than antennae two; accessory flagellum present. Gnathopod one larger than two. Segment five of gnathopod one short, deep; segment six large with setose margin. Pleonal segments separated distally. Terminal spines of uropod three long, slender.

Fig. 170. Microdeutopus sp. Possibly an undescribed species.

PLATE 33 (Figures 165-170)



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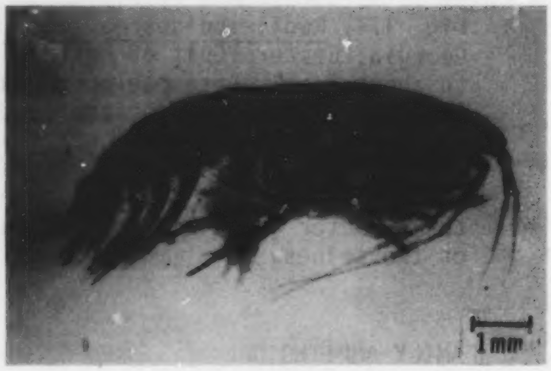

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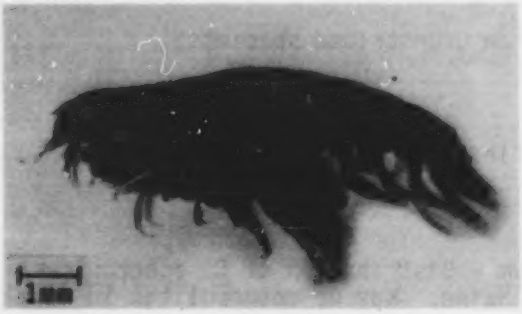

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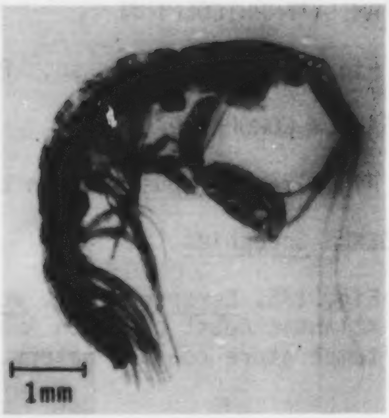

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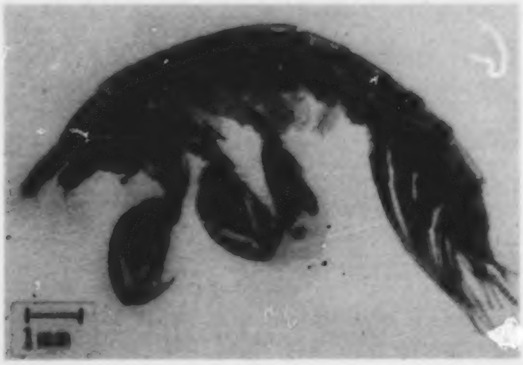

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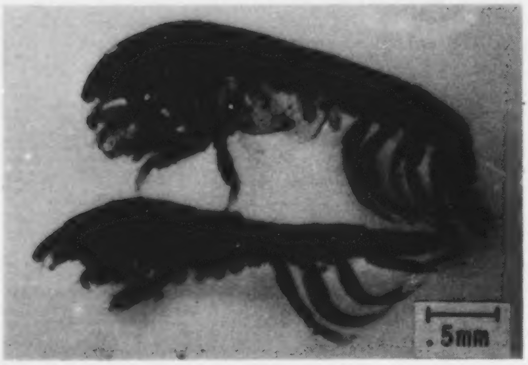

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Fig. 171. *Rudilemboides naglei* - Bousfield, 1973. Cape Cod to Georgia; Eastern Gulf of Mexico; Vineyard Sound; Buzzards Bay. Length to about 3 mm. Antennae one with accessory flagellum; longer than antennae two. Gnathopod one subchelate; gnathopod two weakly subchelate. Segment four of peraeopods three and four expanded anterodistally. Peraeopod five slightly shorter than peraeopods one through four; peraeopod six longer; peraeopod seven longest. Uropod three, outer ramus with paired marginal spines; inner ramus with one or two spines.

FAMILY AMPITHOIDAE

Fig. 172. *Cymadusa* c.f. *compta*. Possibly an undescribed species.

FAMILY AMPHILOCHIDAE

Fig. 173. *Gitanopsis* sp. Possibly an undescribed species.

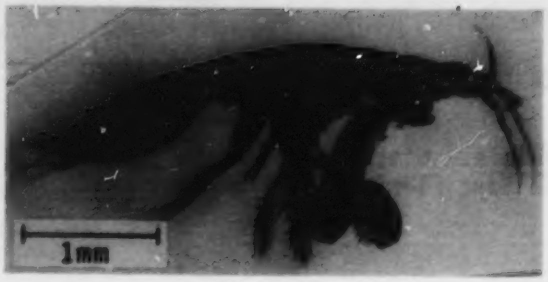
FAMILY COROPHIIDAE

Fig. 174. *Cerapus* sp. An unidentified, possibly new species.

GENUS *Corophium*

Fig. 175. *Corophium* c.f. *acherusicum* - Distribution of *C. acherusicum*; Atlantic Coast of North America to Maine. May be cosmopolitan in warm temperature coastal waters.

PLATE 34 (Figures 171-175)



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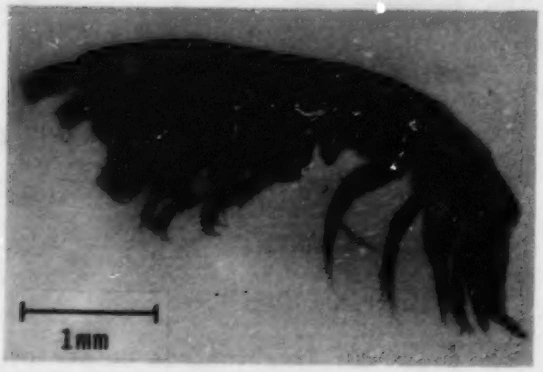

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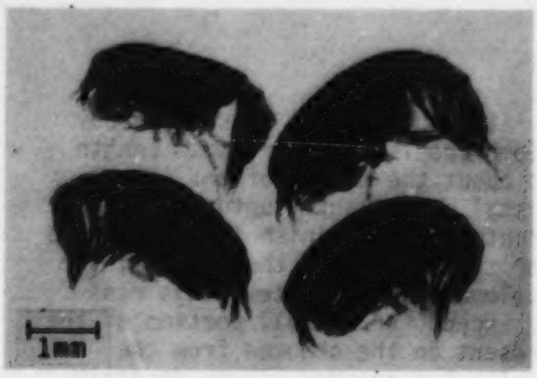

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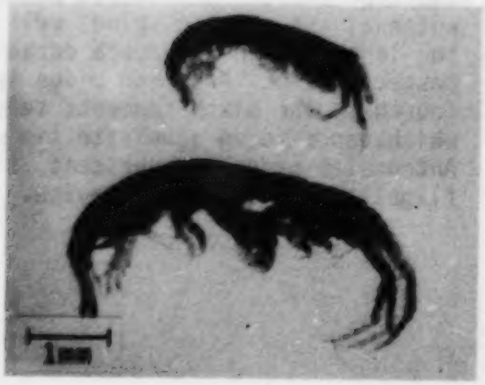

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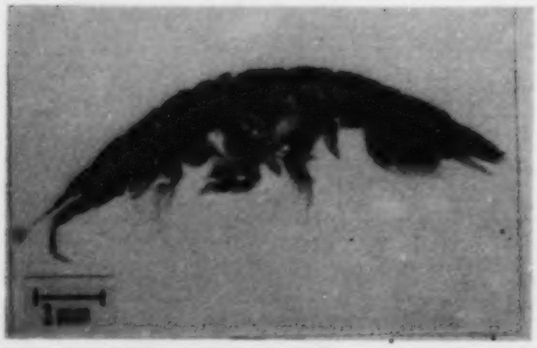

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Fig. 176. *Corophium* c.f. *lacustre*. Distribution of *C. lacustre*; Bay of Funday to Florida; Western Europe.

Fig. 177. *Corophium* c.f. *louisianum*. Distribution of *C. louisianum*; Louisiana; probably Gulf states.

Fig. 178. *Erichthonius* c.f. *brasiliensis*. Distribution of *E. brasiliensis*; Cape Cod to Chesapeake Bay; Florida, Gulf States; West Indies.

FAMILY PODOCERIDAE

Fig. 179. *Podocerus* sp. Possibly an undescribed species.

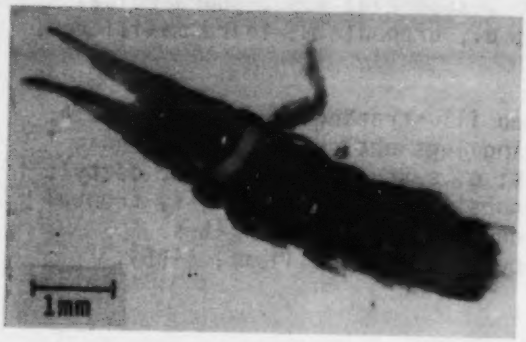
ORDER DECAPODA

SUBORDER NATANTIA

FAMILY PENAEIDAE

Fig. 180. *Trachypeneus constrictus* - Stimpson, 1871. Chesapeake Bay to Texas; Bermuda; Puerto Rico and Sombrero Island; Surinam. Length to about 10 cm. Rostrum projects to about the middle of the second segment of the antennal peduncle; distal end slightly upturned. Upper edge of rostrum with seven to nine teeth which diminish in size toward the tip; a spine is located posterior to the base of the rostrum; antennal and hepatic spines well developed. An elevated ridge runs the length of the carapace dorsally, except for a small portion at the posterior end. A second ridge is present on the abdomen from the fourth to the sixth segment; telson with two rounded ridges dorsally which taper to an acuminate tip with a spine on either side. Antennular peduncle pubescent, slightly longer than antennal scale, flagella shorter than carapace. Eyes large and reniform.

PLATE 35 (Figures 176-180)



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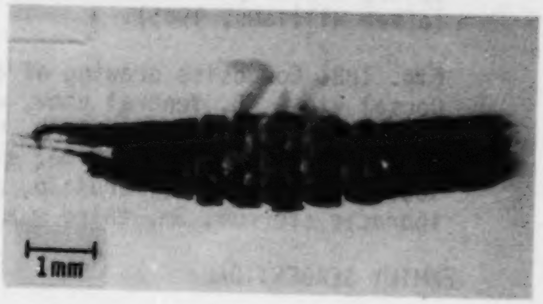

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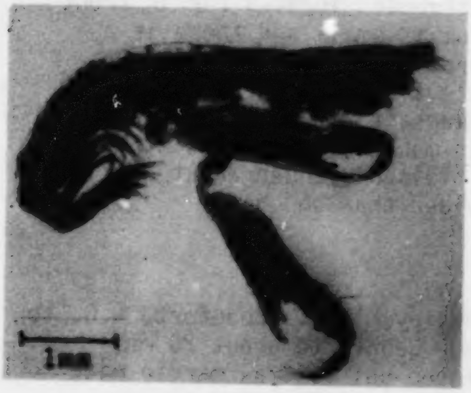

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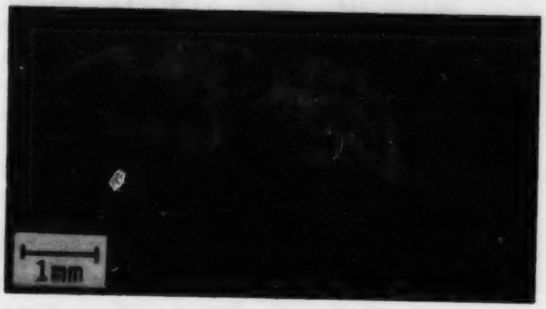

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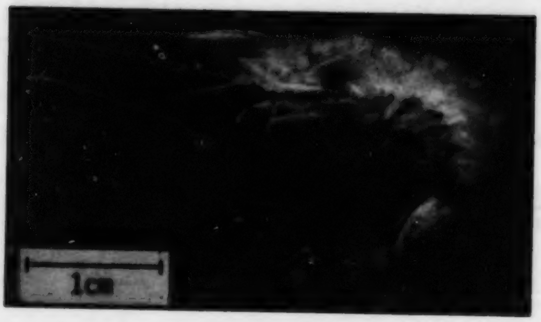

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Fig. 181. Composite drawing of a shrimp exhibiting major features; a., antenna; a.s.c., antennal scale; at., antennula; b., basis; b.s., branchiostegal spine; c., carpus, cx., coxa; d., dactyl; e., eye; end., endopod; ex., exopod; h.s., hepatic spine; i., ischium; m., merus; p., propodus; r., rostrum; sc., subchela; s.s., supraorbital spine; st., stylocerite; t., telson; u., uropod; 3m, third maxilliped. (after Williams, 1965).

Fig. 182. Composite drawing of a crab illustrating major features. A. Dorsal view. B. Ventral view, walking legs not shown. a, antenna; ab, abdomen; at, antennual; b, basis; c, carpus; cx, coxa; d, dactyl; end, endognath; ep, epistome; es, endostome; ex, exognath; f, frontal lobe; i, ischium; m, merus; p, propodus; so, suborbital; t.s., thoracic sternum; 3m, third maxilliped. (after Williams, 1965).

FAMILY SERGESTIDAE

Fig. 183. Lucifer faxoni - Borradaile, 1915. Nova Scotia to Louisiana; Bermuda; West Indies; Coast of South America. Length to about 10 mm. Body small, thin. Anterior portion of thorax elongate and cylindrical. Eyes, antennae and antennules located far in front of the mouth parts and legs. The rostrum is small and there is a small spine on either side behind the prominent stalked eyes. Antennules long, slender. Antennal scale linear fringed with long hairs on inner margin. Three pairs of legs; first pair short; last two nearly as long as carapace. Abdomen much compressed; sixth segment about twice as long as others. Telson slender about half the length of uropods. Exopod longer and wider than endopod.

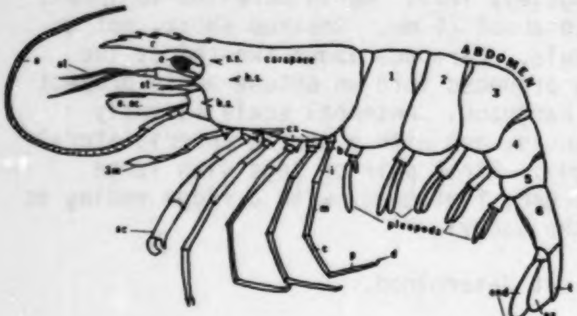
FAMILY PALAEMONIDAE

Fig. 184. Periclimenes americanus - Kingsley, 1878. Beaufort, N.C. to Florida to Mexico; West Indies; Bermuda. Length to about 20 mm. Rostrum strong with 7-10 teeth, tip pointed up; ventral margin with 2-3 teeth. Carapace with antennal and hepatic spines and a post orbital ridge. Eyes well developed. Stylocerite large, sharp, projecting to about the middle of basal antennular article. Antennal scale slightly longer than antennular peduncle with a spine near the base and a spine at the apex. Telson with two pairs of dorsal spines; posterior margin with three pairs of spines.

FAMILY ALPHEIDAE

Fig. 185. Automate sp. Members of this genus have not been reported for this area. The species was not determined.

PLATE 36 (Figures 181-185)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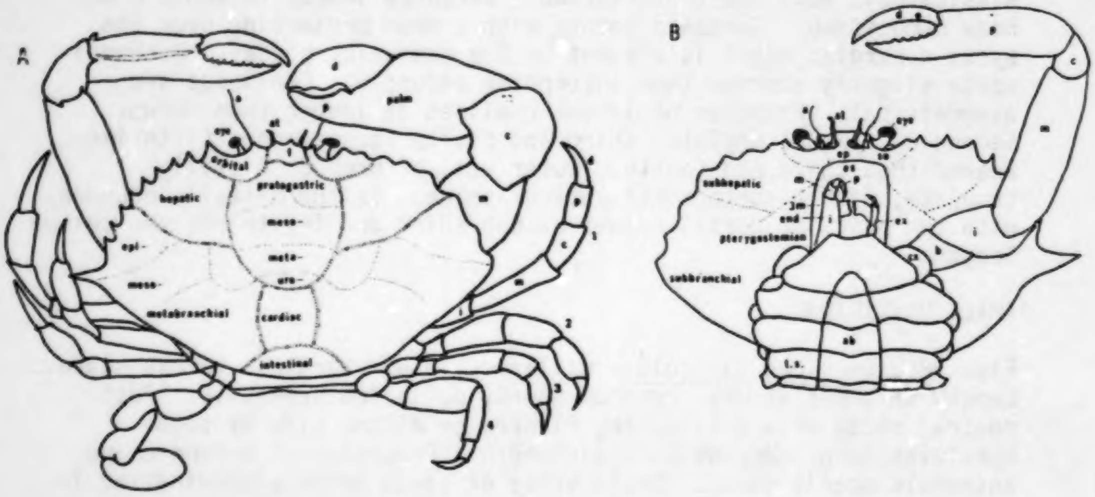
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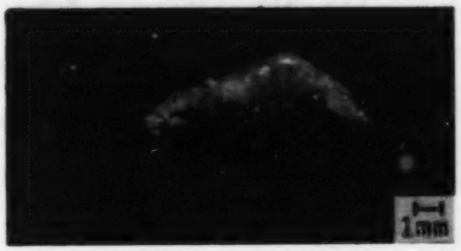

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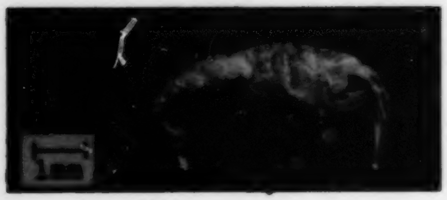

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Fig. 186. *Alpheus normani* - Kingsley, 1878. North Carolina to Texas; Bermuda; West Indies. Length to about 25 mm. Rostrum short, not as long as first article of antennule. Carapace about two-thirds the abdominal length. Ocular hoods produced into an obtuse angle project over each eye; eyes covered by carapace. Antennal scale slightly longer than the antennular peduncle, and with a strong anteriolateral spine. Antennae longer than body. First pair of legs with large unequal chelae; larger chela, broad, flattened, with a ridge ending as a strong tooth at the base of the dactyl.

Fig. 187. *Alpheus* sp. Species not determined.

Fig. 188. *Leptalpheus forceps* - Williams, 1965. North Carolina; Mississippi; West Coast of Florida. Carapace length to about 8 mm. Body compressed. Carapace smooth with a hood projecting over the eyes; a cardiac notch is present on the posterior border. Antennal scale slightly shorter than antennular peduncle. Chelipeds are asymmetrical. Propodus of larage cheliped is longer than merus. Second legs weak, chelate; third and fourth legs strong; fifth leg weaker than third and fourth. Outer rami of uropods distally truncate, with a subterminal lateral spine. Telson distally rounded, with two pairs of dorsal spines at one-third and two-thirds the telson length.

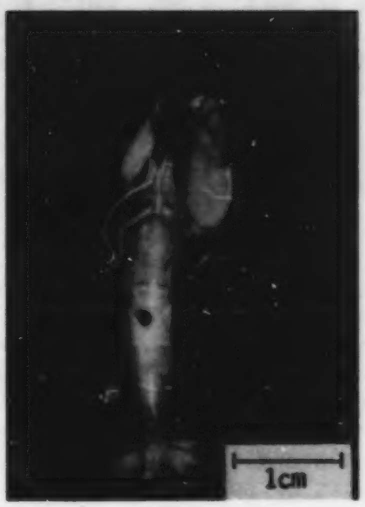
FAMILY OGYRIDIDAE

Fig. 189. *Ogyrides limicola* - Williams, 1955. Virginia to Louisiana. Length to about 15 mm. Rostrum short, deflected ventrally. Post rostral ridge with 8-14 teeth, flanked on either side by setae. Eyestalks long, narrowest at midlength. Peduncles of antennae and antennule nearly equal. Stylocerite of basal article terminating in two spines nearly equal length.

FAMILY HIPPOLYTIDAE

Fig. 190. *Latreutes parvulus* - Stimpson, 1866. North Carolina to Texas; Cuba; Puerto Rico; Guiana; Brazil; West Africa. Length to about 12 mm. Laterally compressed rostrum, nearly circular in female, more elongate in male; dorsal margin with 6-8 teeth in female, 2-4 teeth in male. May have a few small teeth on tip and 0.5 on ventral margin. Carapace with 5-7 postrostral teeth. Antennular peduncle with a broad, rounded stylocerite. Antennal scale twice as long as wide, but not as long as rostrum. First legs thick, equal; second legs more slender.

PLATE 37 (Figures 186-190)



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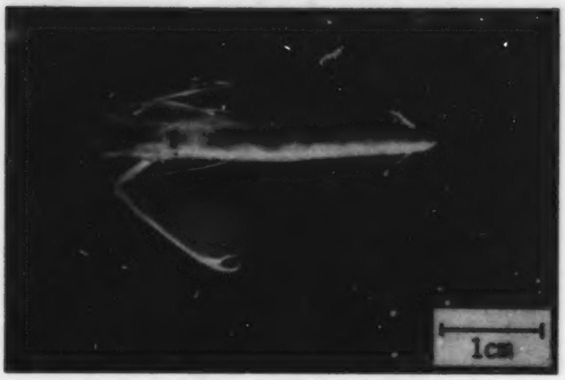

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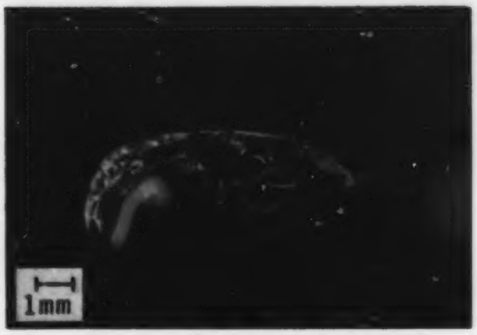

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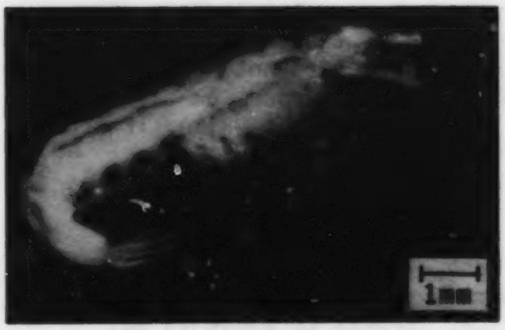

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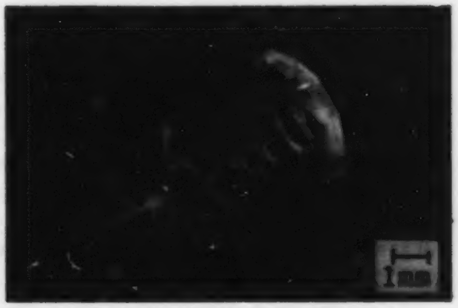

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FAMILY PROCESSIDAE

Fig. 191. *Ambidexter symmetricus* - Manning and Chace, 1971. Gulf of Mexico to Trinidad. Length of carapace to about 5 mm. Rostrum short not reaching beyond eye. Antennal spine present. Stylocerite unaramed rounded laterally. Second pair of peraeopods with 4 meral and 9-10 carpal articles. Fifth abdominal somite without posterolateral spine.

Fig. 192. *Hippolyte zostericola* - Smith, 1873. Massachusetts, through Gulf of Mexico; West Indies to Curacao. Length to about 12 mm. Rostrum long, about equal to antennal scale, with 3-4 dorsal teeth and 2-5 teeth ventrally. Anterior margin of carapace produced into a lobe beneath the eyes from which protrudes an antennal spine. Hepatic spine present. Basis of antennular peduncle long and broad with a slender divergent stylocersite. Antennal scale large, with a small terminal spine on the outer margin; a spine is also present at the base of the scale. Abdomen strongly bent at thrid segment; hoodlike projection of posterior portion of third segment overhanging fourth segment. Two pairs of dorsal spines on lateral border of the telson. Tip of telson is truncate with three pairs of spines.

SUBORDER REPTANTIA

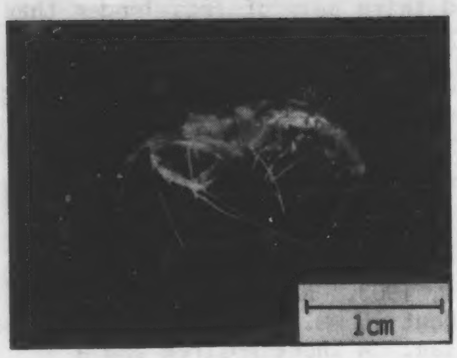
FAMILY CALLIANASSIDAE

Fig. 193. *Callianassa atlantica* - Rathbun, 1926. Nova Scotia to both sides of Florida. Length to about 60 mm. Exoskeleton smooth thin. Carapace about one-third abdomen length. A small acute rostrum bounded on either side by a small triangular protrusion. Eyestalks short pointed tips curved up and out; cornea on outer border. Peduncle of antellule about half the length of the carapace. Antennae longer than carapace; peduncle shorter than that of antennules. Chelipeds unequal, and sexually dimorphic. No pleopods on first and second abdominal segments of males. Telson as long as wide. Exopods broader than endopods, both fringed with hairs distally.

FAMILY PORCELLANIDAE

Fig. 194. *Petrolisthes galathinus* - Bosc, 1801. North Carolina through Gulf of Mexico; Caribbean; portions of South America; portions of Pacific Ocean around Central America. Length to about 15 mm. Carapace slightly longer than wide, with transverse ciliated rugae. Rostrum broad, triangular. Eyes well developed. First article of antennae with a median spine tiped lobe. Chelipeds large, covered with ciliated rugae. Carpus twice as long as wide with spines along margins.

PLATE 38 (Figures 191-194)



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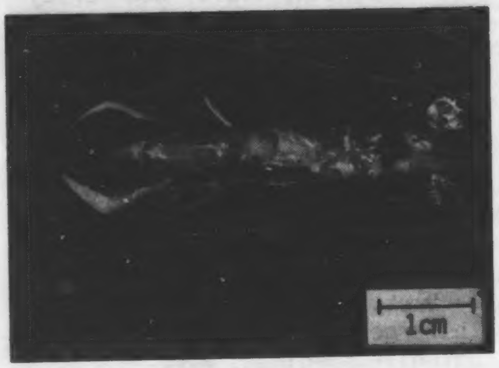

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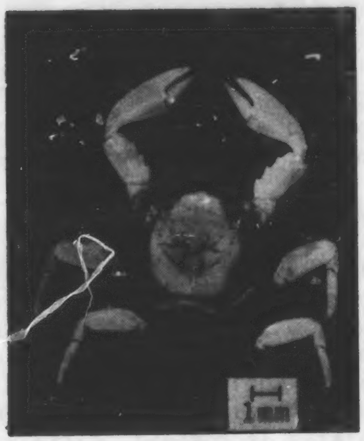

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Fig. 195. *Euceramus praelongus* - Stimpson, 1860. Chesapeake Bay to Texas. Length to about 14 mm. Carapace elongate, subcylindrical, with very fine transverse rugae; anterior margin tridentate; anteriolateral margins with two or more spines behind antennae. Antennae three-fourths the length of the body; antennules short. Chelipeds large, subequal. Second and third pair of legs longer than first; last pair small turned dorsally. Abdomen small, uropods reduced.

FAMILY PAGURIDAE (Hermit crabs)

Fig. 196. Unidentified juvenile pagurid.

FAMILY ALBUNEIDAE

Fig. 197. *Lepidopa websteri* - Benedict, 1903. North Carolina to Mississippi. Length of carapace to about 15 mm. Carapace as broad as long, anterior margin fringed with setae. A short rostrum and a lateral, broadly triangular protuberance to either side. Dorsum of carapace with a ciliated band with ends pointing posteriorly. Mid-dorsal region with a narrow transverse ciliated band and two lateral oblique bands. Eyestalks diamond shaped. Peduncles of antennules longer than eyestalks. First pair of legs broad, flattened, subchelate. Fifth legs reduced, folded back. Abdomen short, folded under thorax.

FAMILY LEUCOSIIDAE

Fig. 198. *Persephona punctata aquilonaris* - Rathbun, 1937. New Jersey to Mexico. Length to about 50 mm. Carapace inflated, globular, covered with granules; three sharp recurved spines along posterior margin. Front narrow, bidentate, elevated.

FAMILY XANTHIDAE

Fig. 199. *Menippe mercenaria* - Say, 1818 (Stone crab). North Carolina to Mexico; Bahamas; Cuba; Jamaica. Carapace length to about 90 mm, oval, with smooth appearance. Anterolateral margin divided into four lobes; front narrow with a median cleft and a trilobate lobe on either side. Chelipeds large, heavy, unequal. Dactyl of major chela with a large basal tooth; immovable finger with large subbasal tooth. Walking legs stout, distally setose. Juvenile specimens were occasionally obtained.

Fig. 200. *Neopanope texana texana* - Stimpson, 1959. Virginia through the Gulf of Mexico. Length to about 20 mm. Carapace convex, minutely pubescent. Frontal edge rounded with a small medial notch. Anterolateral margin of carapace with 5 triangular teeth. Chelipeds unequal, smooth, without a large tooth at base of major dactyl. Fingers white or horn colored. Walking legs long, slender.

PLATE 39 (Figures 195-200)

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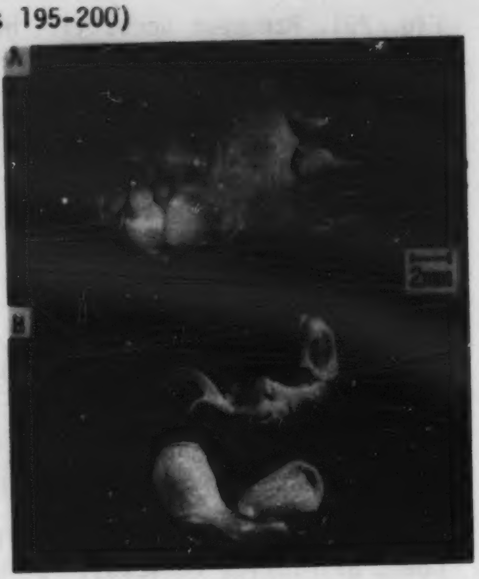

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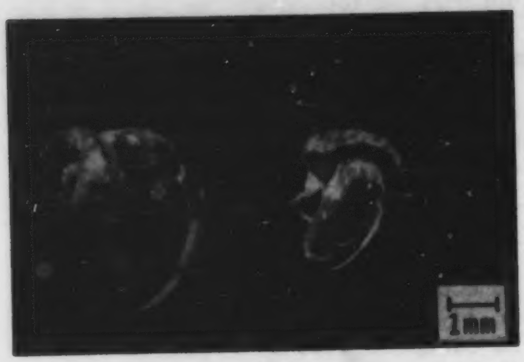

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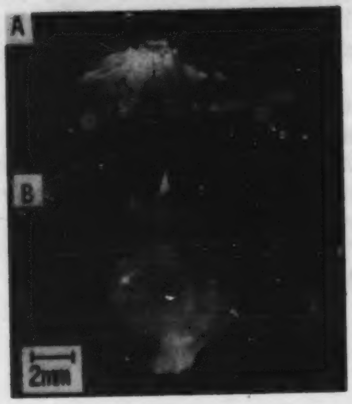

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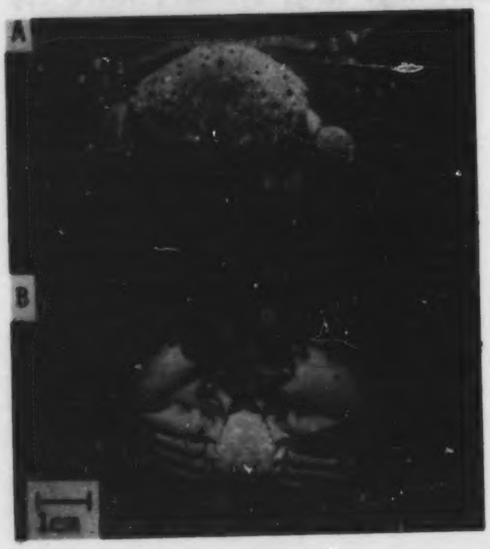

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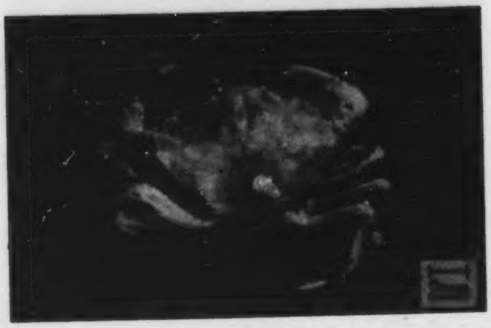

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Fig. 201. Panopeus herbstii - H. Milne Edwards, 1834. Massachusetts to Brazil; Bermuda. Length to about 25 mm. Regions of carapace well marked. Anteriolateral margins with five teeth; a transverse ridge projecting inward from fifth tooth. Front wide with a small medial cleft. Chelipeds heavy, dissimilar, unequal; carpus with a blunt internal spine. Major cheliped with large teeth at base of dactyl. Fingers of chelipeds dark.

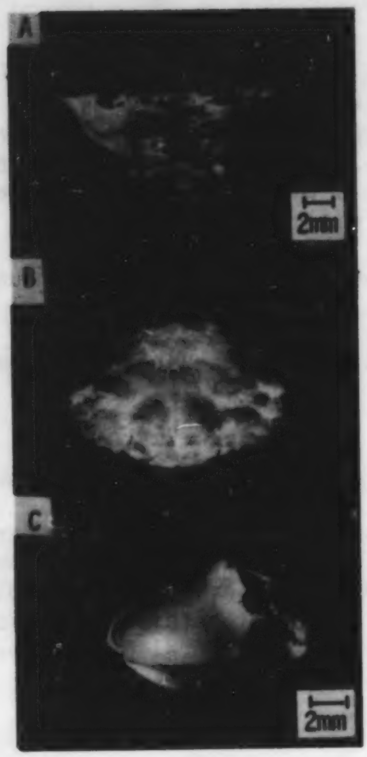
FAMILY PINNOTHERIDAE

Fig. 202. Pinnixa chaetopterana - Stimpson, 1860. Massachusetts to Texas; areas off Brazil. Length to about 6 mm. Carapace transversely oval, about twice as long as wide, sides pubescent. Regions well defined. Front narrow with median cleft; posterior margin concave. Chelipeds stout, male different from female. First and second pair of walking legs slender; third and fourth pair stout. This species lives as a commensal in the tube of Chaetopterus variopedatus

Fig. 203. Pinnixa retinens - Rathbun, 1918. Chesapeake Bay; Gulf Coast of Florida to Texas. Length about 5 mm. Carapace almost twice as wide as long, nearly flat. Lateral margins with a granulate ridge; posterior margin with a shallow groove. Chelipeds small, fingers slender. Third walking legs stout, slightly longer than others; ischium, merus and propodus with stout spines.

Fig. 204. Pinnixa sayana - Stimpson, 1860. Massachusetts to North Carolina; Gulf of Coast of Florida to Louisiana. Length to about 6 mm. Carapace smooth, pubescent laterally. A low transverse ridge near posterior margin about one-third carapace width. Front narrow deeply grooved chelipeds stout, flattened, very short immovable finger; dactyl strongly curved. Walking legs long, slender; third leg stouter than others.

PLATE 40 (Figures 201-204)



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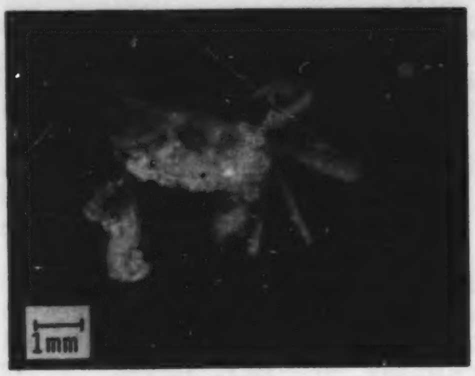

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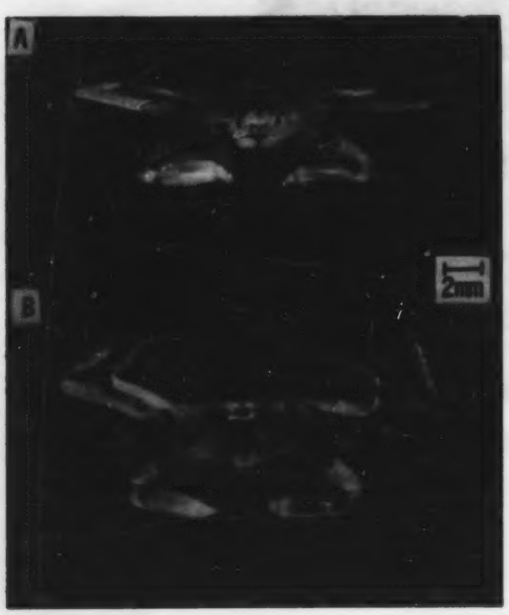

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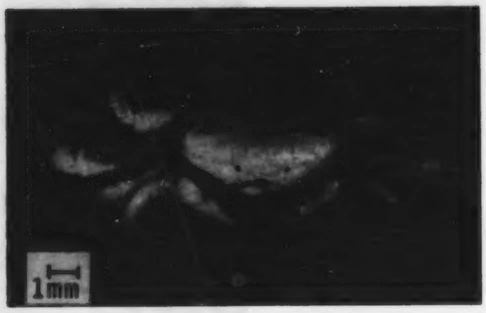


203

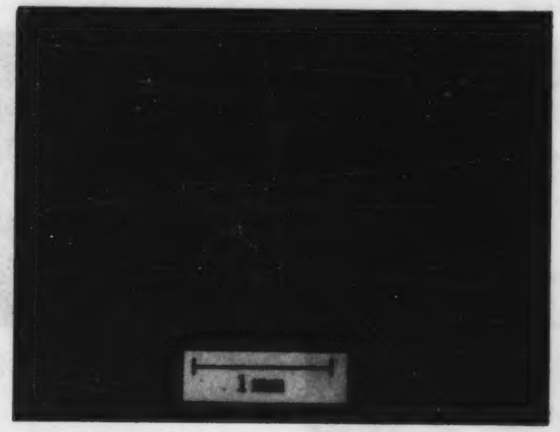
CLASS PYCNOGONIDA (PANTOPODA) - Sea Spiders

Definition: Small spiderlike animals consisting of a small trunk serving as a base for the 4 pairs of walking legs. The legs have 8 segments and usually a terminal claw. The head contains a tubular proboscis and usually 1-2 pairs of appendages, the celifores and palpi. Males have a third pair of appendages, the ovigers, used to carry the female's eggs.

Pcynogonids were usually rare in the study area, only one species found, and were seldom collected in benthic grab samples. However, they occasionally are abundant when suitable prey are present, such as bryozoans, hydroids, sponges or algae and can be found clinging to these.

FAMILY PHOXICHILIDIIDAE

Fig. 205. Anoplodactylus pygmaeus - (Hodge, 1864). Body length about 0.75 mm. Cephalic segment short, little beyond the base of the proboscis and without auxiliary claws. Second tibia as long as first or only slightly shorter. Proboscis cylindrical and the eye tubercle and abdomen not conspicuously long. Basal spines of propodus simple (not denticulate). Fingers of chela short. Eye tubercle cylindrical, not conical. Small tubercles at the ends of the lateral processes. Propodus with 2-3 or more large spines at base.



205

CLASS MEROSTOMATA

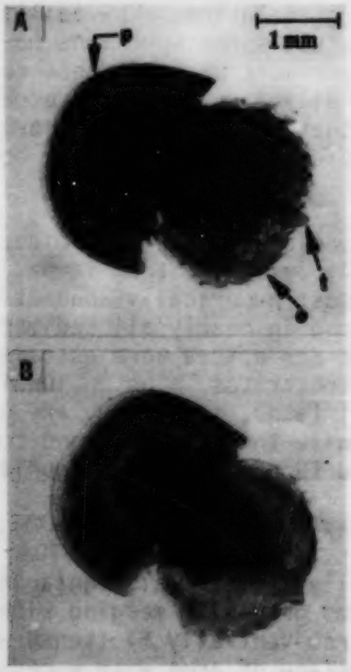
SUBCLASS XIPHOSURA - Horseshoe Crabs

Definition: Two main body divisions; the horseshoe shaped cephalothorax (prosoma) and the hexagonal abdomen (opisthosoma). There is a pair of compound eyes dorso-laterally on the prosoma. The abdomen is armed with 6 spines on each side and a posterior spikelike, telson. The prosoma has 5 pairs of walking legs, the opisthosoma 5 pairs of book gills.

ORDER XIPHOSURIDA

FAMILY LIMULIDAE

Fig. 206. Limulus polyphemus (Linnaeus). Horseshoe Crab. Northwest Atlantic Coast to Florida and the Gulf of Mexico. Identification - same as above definition. Adult specimens (lengths up to 600 mm, including telson) are not collected with weight remote sampling gear. However, juveniles up to several centimeters length are occasionally obtained. A juvenile specimen is pictured here. A. Dorsal view, p, prosoma; o, opisthosoma; t, telson. B. Ventral view.



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SECTION 8

PHYLUM ECHINODERMATA

Definition: Body with pentamerous radial symmetry. Form varies; subspherical, ovoid, starlike, elongate cylindrical or wormlike. May be free living or fixed by a stalk. An internal skeleton is present composed of calcareous ossicles which may be loose and flexible or fused to form a rigid skeletal test. The skeleton usually bears projecting spines or tuberlces imparting a spiny or warty appearance to the body surface. An internal water-vascular system is present and functions primarily for locomotion. There is a well-developed digestive tract but no excretory system. The sexes are nearly always separate.

The echinoderms are exclusively marine and are among the most familiar marine invertebrates. Most are motile bottom dwellers. They also exhibit a substantial power of regeneration. The ability is important to remember for identification purposes, since specimens may be obtained that are in the proess of growing back lost parts. These regenerating individuals may appear to be morphologically aberrant when compared to the characteristics of normal animals. Another feature, particularly prevalent among the Ophiuroidea, is the autotomy of arms or other body parts when disturbed or handled roughly.

Representatives of three classes, the Asteroidea, the Echinoidea and the Ophiuroidea were commonly collected from Tampa Bay. The brittlestars (Ophiuroidea) were the most numerically abudant and most frequently obtained. They were found in nearly all sediment types. The less abundant, Asteroidea and Echinoidea were associated with the cleaner, firmer, sand or shelly substrates. The Ophiuroida are considered to be members of the benthic infauna, since they are usually found borrowing within the sediments, while the asteroids and cechinoids, which crawl about on the sediment surface are more appropriately lableed as epifauna.

CLASS ASTEROIDEA (Figures 208-210) ORDERS PAXILLOSIDA, PLATYASTERIDA SPINULOSIDA

Definition: Body radially symmetrical, pentagonal or stellate with five or more arms gradually merging with the central disc. Body usually dorso-ventrally flattened with a ventral mouth. Ventral surface of arms with a central groove containing rows of podia (tube feet). The madreporite is located dorsally.

The Asteroidea also known as starfish or sea stars are easily recognizable. The asteroid is composed of a central disc from which arms or rays project. Sea stars are typically pentaranous. Although individuals having fewer or greater numbers of rays are common. The three species presented here all have five rays as the normal condition. They are predators and/or scavengers and creep across the sediment, by means of numerous ventral tube feet, to locate prey and food items.

The number, shape and arrangement of the skeletal ossicles are important taxonomic characteristics of echinoderms, as well as the numbers and types of projecting spines or tubercles. Figure 207 diagramatically depicts a cross section view of the ossicle arrangement in the arm of a sea star.

CLASS ECHINOIDEA (Figures 211-213) ORDERS ARBACIOIDA, TEMNOPLEURIDA, CLYPEASTEROIDA

Definition: Calcareous skeleton fused forming a rigid globular or disclike test. Movable spines project from test. They may exhibit pentamerous radial symmetry or bilateral symmetry (secondarily derived). Mouth located ventrally, anus dorsally or laterally.

The sea urchins and sand dollars are relatively large members of the benthic community. The sea urchins can be considered as epifaunal scavengers, moving about on the surface of the substrate in search of plant or animal material. Sand dollars are usually located just beneath the sediment surface and at times are locally abundant. The mouth contains a distinctive chewing apparatus known as Aristotle's lantern. The Spatangoida, not covered here, lack the apparatus.

CLASS OPHIUROIDEA (Figures 214-222) ORDER OPHIURIDA

Definition: The body (disc) is flattened, circular or pentagonal in shape, and sharply differentiated from the five symmetrically located arms (rays). The arms are thin, long and serpentlike, with reduced podia. The madreporite is located ventrally and is obscure. Mouth ventral.

The Ophiuroidea are also commonly known as brittle stars, serpent stars, snake stars or sand stars. Seven species were collected from Tampa Bay. All are burrowing forms of the family Amphiuridae. They are found in all sediment types, ranging from clean sand to silty mucks.

The mechanical process of collecting benthic samples (obtaining a grab sample, sieving the sediment, preservation, etc.) often causes ophiuroids to autotomize the disc and/or portions of the arms. This can complicate identification if more than one species is present in a sample. Therefore, in order to minimize damage by autotomy, samples should be processed gently and a relaxant used before specimens are preserved. Formalin softens the calcereous skeleton of ophiuroids and may cause specimens to fragment. Seventy percent ethyl alcohol is a preferred preservative.

The relative size and proportions of an individual can be seen in Figure 214. Figure 215 schematically depicts features important for identification of an amphiurid brittlestar to the genus and species level. These characteristics are usually most easily observed when specimens are first air dried. However, drying makes the animals even more brittle, so gentle handling is required.

CLASS ASTERIODEA

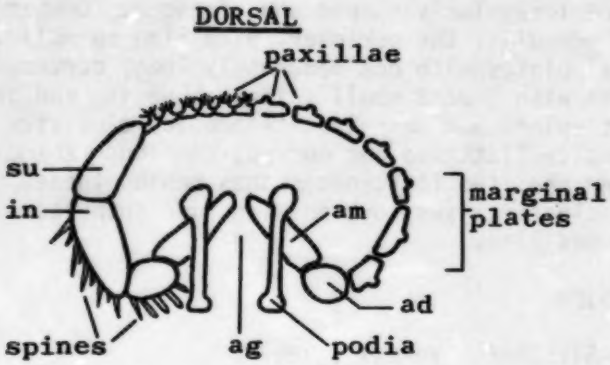
Fig. 207. Schematic cross-section of a sea star ray. Right and left sides represent two different types of sea star. Abbreviations as follows: ad, adambulacral plate; ag, ambulacral groove; am, ambulacral plate; in, inframarginal plate; su, supramarginal plate. (Modified from Hickman, 1967; and Gosner, 1971).

ORDER PAXILLOSIDA

FAMILY ASTEROPECTINIDAE - Gray, 1840

Fig. 208. Astropecten articulatus - (Say, 1825). Chesapeake Bay to the Gulf of Mexico to Columbia. Five arms, moderately long. The paxillar areas on the arms about twice the width of the marginals. Paxillae arranged in transverse rows except at the midregion of the arms and the disc. A uniform covering of spinules on the paxillae gives a granulate appearance to the dorsal surface. Superomarginal plate higher than wide, covered with granules, and may bear a small spine on the arms. Interradial superomarginals without spines. Inferomarginal plates with a pair of flattened spines and sometimes a third spine proximal to them. Below they are covered with small spines and spinules. Six or fewer tiny actinal interradial plates with a small, central spine surrounded by fine spinules. The adambulacral plates with 3 or 4 slender spines side by side behind which are 2 larger, flattened, truncate spines and behind these 3 smaller spines. Prominent, elongate mouth plates covered with small spines. On either side there is a double row of spinules and a cluster of short, thick, blunt spines at the apex. A conspicuous round madreporite lies flush with the surface and is covered with fine gyri.

PLATE 41 (Figures 207-208)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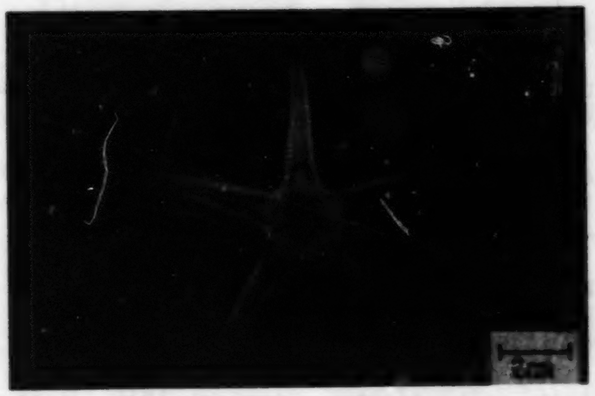


208

ORDER PLATYASTERIDA

FAMILY LUIDIIDAE - Verrill, 1899

Fig. 209. Luidia clathrata - (Say, 1825). New Jersey to Brazil. Five arms, skeleton compact. Paxillae are square, in regular longitudinal and transverse rows except on the disc and the midregion of the arms, where they are irregularly shaped and arranged. Center of paxillae covered with granules, the periphery with fine spinules. Inferomarginal plates with one moderately long, curved, flattened marginal spine with 1 or 2 small spines above it, and below a covering of very short spines and spinules. Adambulacral plates with 2 furrow spines, laterally flattened and curved; the inner spine more slender than the outer one; two flattened spines behind these. Oval spines form a thick cluster; jaws covered with fine spinules. Madreporite concealed by paxillae.

ORDER SPINULOSIDA

FAMILY ECHINASTERIDAE - Verrill, 1867

Fig. 210. Echinaster sp. The various species of Echinaster are not well known for the Tampa Bay area. The specimen figured may be Echinaster (Verrillaster) spinulosus. (See Downey, 1973).

CLASS ECHINOIDEA ORDER ARBACIOIDA

FAMILY ARBACIIDAE - Gray, 1855

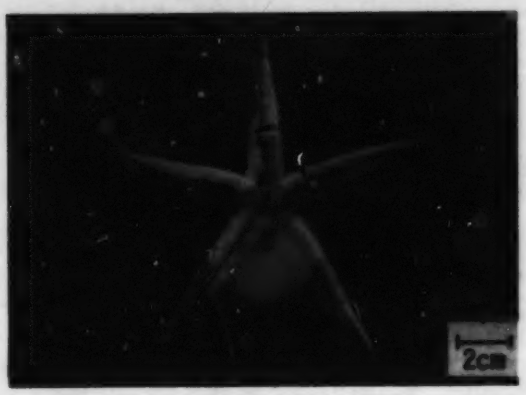
Fig. 211. Arbacia punctulata - Lamarck, 1816. Cape Cod to the Gulf of Mexico and the West Indies. Test globular, radially symmetrical. Spines long, the longest about half the test diameter. Dorsally, the spines are acutely pointed becoming spatulate more ventrally. The periproct with 4 plates; occasionally 3 or 5. Color reddish brown or purple to almost black.

ORDER TEMNOPLEURIDA

FAMILY TOXOPNEUSTIDAE - Troschel, 1872

Fig. 212. Lytechinus variegatus - Lamarck 1816. Test globular, radially symmetrical. Spines blunt, short dorsally (about 5 mm) increasing to about 2 x as long as ventrally (about 11 mm; in a specimen with a test diameter of 5.5 cm). Periproct with numerous small plates (about 14). Color pink, base of spines and small spines green.

PLATE 42 (Figures 209-212)



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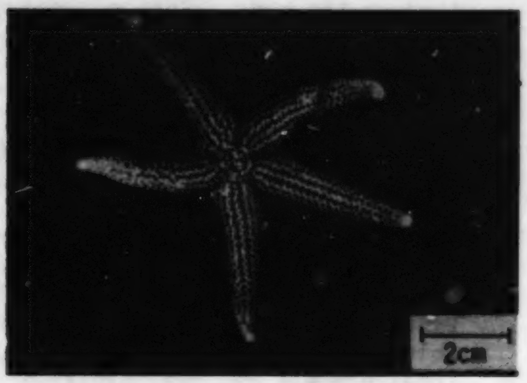

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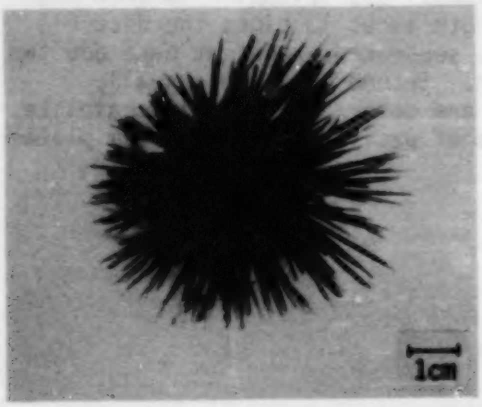

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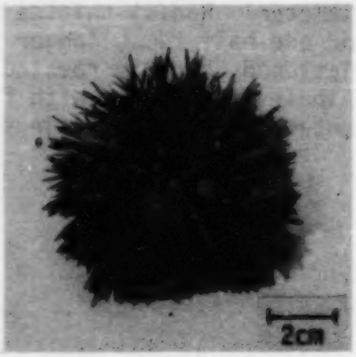

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ORDER CLYPEASTEROIDA

FAMILY MELLITIDAE - Stefanini, 1911

Fig. 213. Mellita quinquiesperforata Leske. Nantucket to Brazil. Test flat, disclike. Five narrow openings (lunules) pass completely through the body. Test covered with short slender spines. Mouth slightly anterior of center.

CLASS OPHIUROIDEA

Fig. 214. Ophiuroid specimen (Micropholis atra). Note the relatively small body and the five long sinuous arms.

Fig. 215. Features of an Amphihurid Brittlestar. A - dorsal view of disc; ds, dorsal scales; dap, dorsal armplate; p, pappilae; pp, primitive plate; rs, radial shield; acs, accessory shield. B - ventral view of one arm and a portion of the disc, asb, arm spine (blunt); asp, arm spine (pointed); as, adoral shield; j, half-jaw (oral plate); op, oral papillae; os, oral shield; s, side arm plate; t, tentacle, ts, tentacle scale; vap, ventral arm plate.

ORDER OPHIURIDA

FAMILY AMPHIURIDAE

Fig. 216. Amphioplus abditus - Verrill, 1871. East Coast of the United States to West Florida. Panama. Disc diameter to 10.0 mm, covered with small scales. Arm length about 10 times the disc diameter. Radial shields straight, separated except at base and two and one-half times longer than wide. Second arm spine usually flattened, broadly rounted at tip, and covered with small grainlike spinules. Each jaw with five pairs of papillae. Ventral arm plates pentagonal, two tentacle scales.

PLATE 43 (Figures 213-216)

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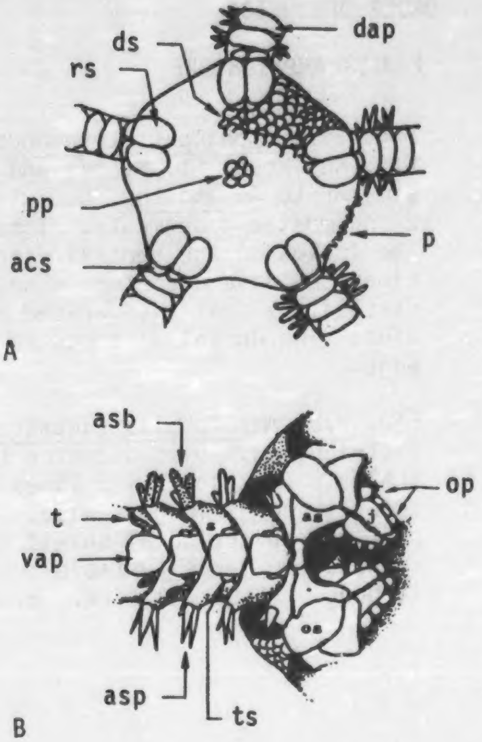
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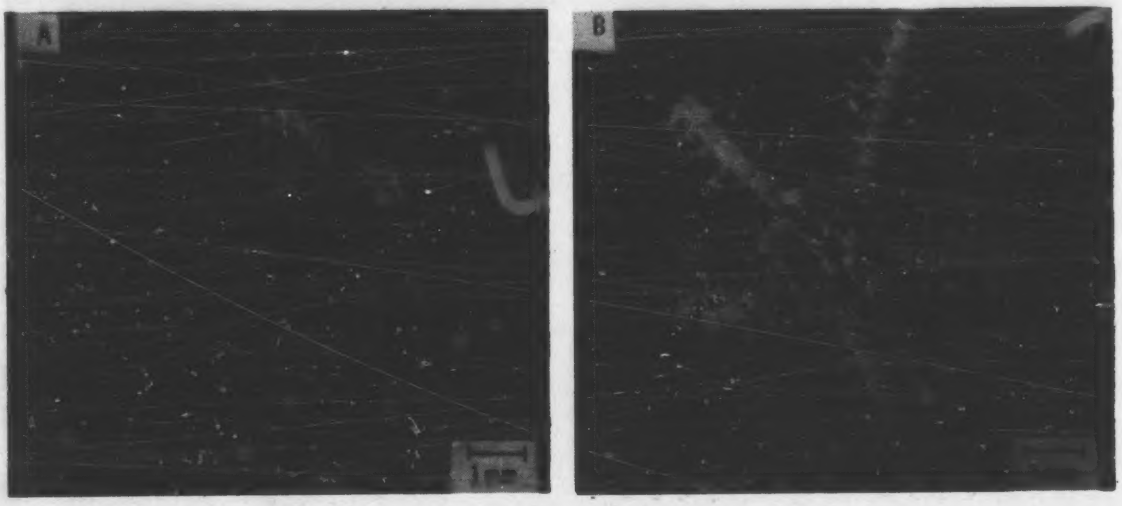

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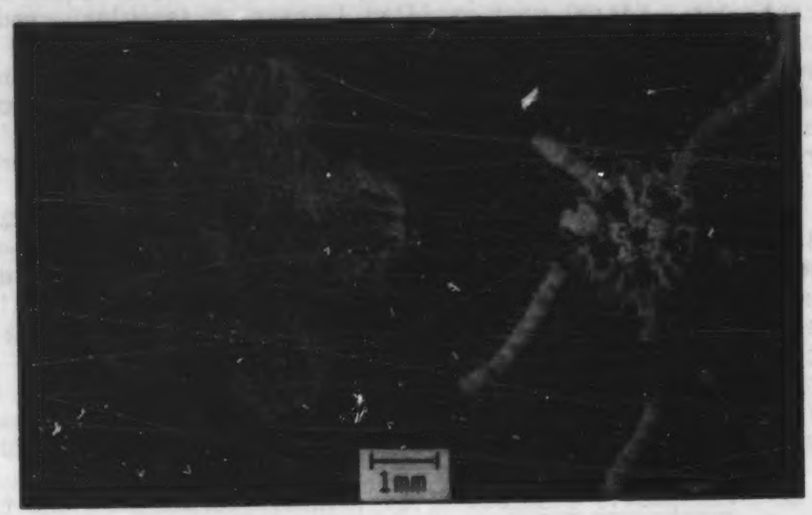
ORDER OPHIURIDA

FAMILY AMPHIURIDAE

Fig. 217. *Amphioplus thrombodes* - H.L. Clark, 1918. Florida, Biscayne Bay, Key West, Ft. Myers, and Tampa. Disc diameter to 6.0 mm, very similar to *A. abditus*, but with only one tentacle scale (occasionaly 2) on most arm segments. Three arm spines, all slender and pointed. The scales on the ventral disc surface are very small. Arms about 10 times the disc diameter. The radial shields are straight, joined distally, slightly separated proximally, 1.5 to 2.5 times longer than wide. The dorsal disc scales may be slightly swollen at their distal edge.

Fig. 218. *Amphipholis squamata* (Delle Chiaje, 1829). Cosmopolitan Distribution. Disc diameter to 3.0 mm in diameter, covered with large scales. Arms short 4-5 times disc diameter. Radial shields joined, about twice as long as wide. Three pairs of oral papillae, distal pair opercular. Oral shield as wide or wider than long. Three arm spines, two large tentacle scales. Dorsal arm plates non-overlapping. A. Dorsal View. B. Ventral View.

PLATE 44 (Figures 217-218)



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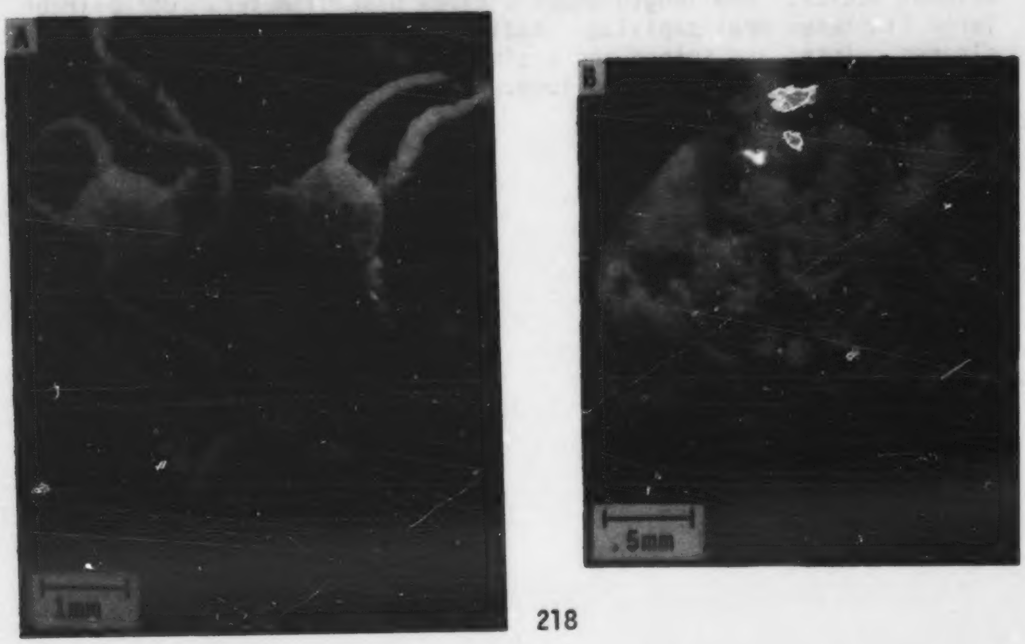

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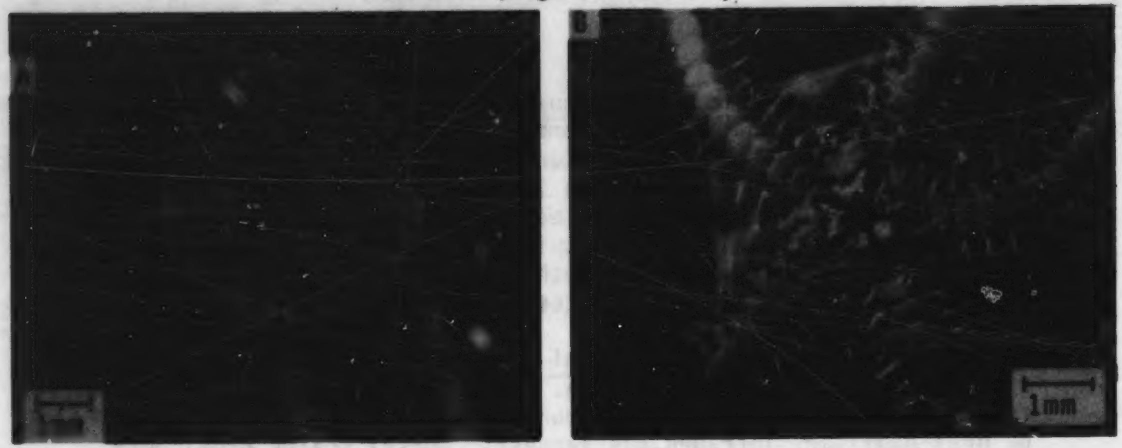
Fig. 219. *Micropholis atra* (Stimpson, 1852). New York and Virginia to the Gulf of Mexico. Disc diameter to about 8.0 mm, with arms about 7 times disc diameter. Infradental papillae smallest or equal to adjacent ones. Distal most papillae largest, triangular, tending to reduce the size of the gap between jaws. Oral shield diamond shaped, longer than wide; 2 tentacle scales, 3 arm spines acutely pointed, slender; ventral arm plates narrower at distal end than at proximal: dorsal arm plates wider than long, entire disc scaled, ventral scales numerous, smaller than dorsal, large scales bordering disc surface.

Fig. 220. *Micropholis gracillima* - (Stimpson, 1852). South Carolina; Florida; Bermuda; West Indies; Honduras and Brazil. Disc diameter to 6.0 mm, covered with fine scales. Arm length about 20 times disc diameter. Radial shields slender 3 times as long as wide, joined about one half of length. For or five pointed arm spines near disc, reduced to three more distally. Two narrow tentacle scales. Ventral arm plates pentagonal, about as long as wide. Three pairs of oral papillae, the distal pair opercular. Oral shields diamond shaped, longer than wide. Dorsal arm plates about half as long as wide.

Fig. 221. *Hemipholis elongata* - (Say, 1825). South Carolina to both sides of Florida; Puerto Rico; Trinidad and Brazil. Disc diameter to 9.0 mm; dorsal surface with well defined scales, ventral surface without scales. Arm length about 8 times disc diameter. One pair of large flattened oral papillae. Radial shields as long as wide. Three slender pointed arm spines and a single tentacle scale. Dorsal arm plates are 3 times wider than long.

PLATE 45 (Figures 219-221)



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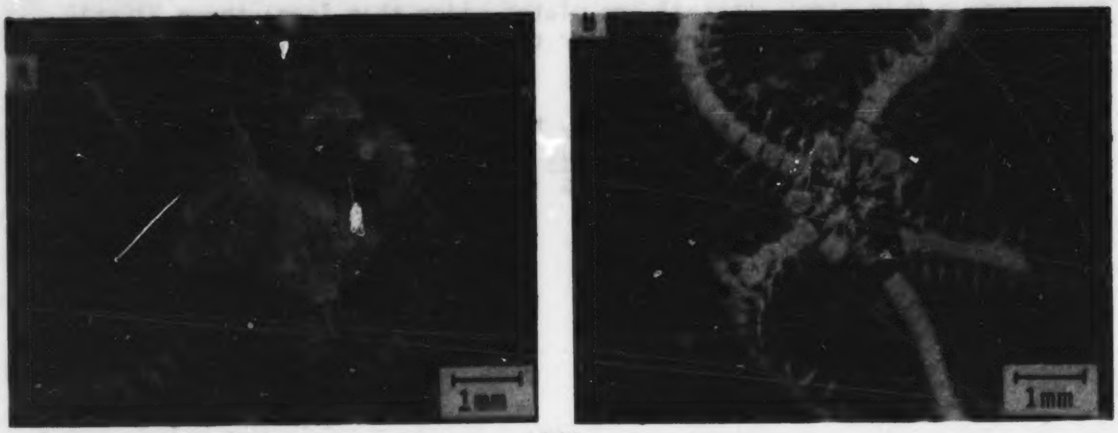

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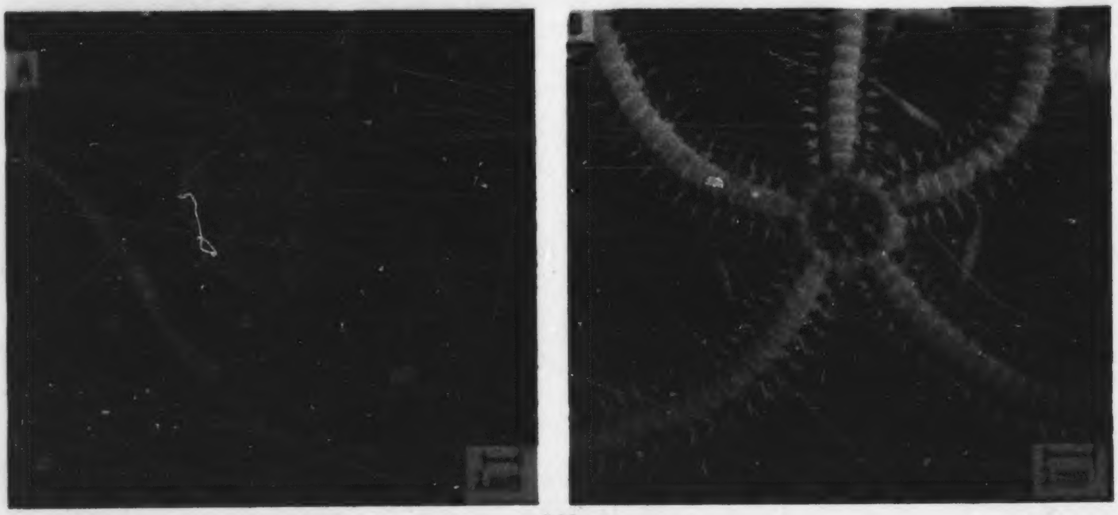

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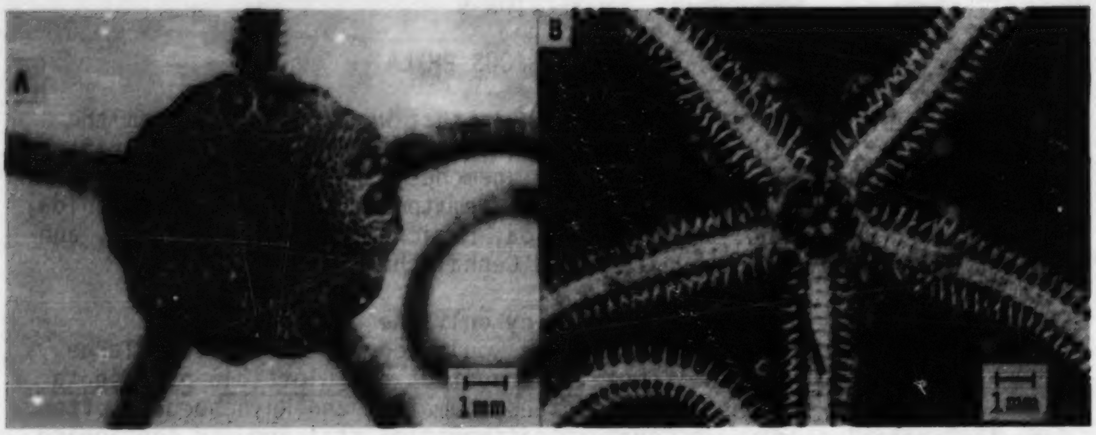
Fig. 222. *Ophiophragmus filograneus* (Lyman, 1875). Florida, from Lake Worth on the east coast to the Tampa Bay region on the west coast. Disc diameter to 9.0 mm, with a fence of small blunt papillae around the distal margin. Dorsal scales large, prominent; ventral scales covered with papillae-like granules. Three pairs of oral papillae. Arms with three bluntly rounded spines. Near the disc the middle spine may have small terminal teeth. Dorsal arm plates three times wider than long; ventral arm plates pentagonal.

Not. Fig. *Ophiophragmus wurdemani* (Lyman, 1860). West Coast of Florida; Beaufort, North Carolina. Disc diameter to 9.0 mm, with a fence of small blunt papillae around the distal margin. Three pairs of oral papillae, infradentals largest. Dorsal scales prominent; radial shields large joined along entire length and about 1.5 times longer than wide. Ventral arm plates wider than long; three bluntly pointed arm spines. Very similar to *O. filograneus*, but lacks the ventral papilla-like granules.

O. wurdemani was not collected by the author. However, because of the close similarity to *O. filograneus* and because it has been reported for this area the description was included.

PLATE 46 (Figure 222)



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SECTION 9

MISCELLANEOUS PHYLA

This section includes all remaining phyla that were recovered from the study area. The following phyla are included in this section: Porifera (sponges), Coelenterata (hydroids and anemones), Platyhelminthes (flatworms), Rhynchocoela (nemertines), Nematoda (roundworms), Phoronida, Branchipoda, (lamp shells), Sipunculida, Hemichordata (acorn worms), and Chordata (subphylum Urochordata), and Cephalochordata.

Most of these phyla were represented by only one or two species. Occasionally, certain of these species would occur in relatively large numbers, such as *Molgula occidentalis* Traustedt and *Glottidia pyramidata* Stimpson. Phyla such as Plathelminthes, Nematoda and Rhynchocoela often require special procedures, such as differential staining and sectioning, for positive identification. The marine species of these phyla have not been as intensively studied as the more common groups, such as polychaetes, molluscs, crustaceans and echinoderms. Consequently, there is not as much information available for identification of these animals.

The following sections are arranged in a phylogenetic manner, that is, from the most simple body plan (Porifera) to the most complex (Chordata).

PHYLUM PORIFERA (SPONGES)

Defintion: Multicellular animals without formed organs or organ systems. They are sessile, ranging from encrusting forms to large amorphous masses or well defined structures. Sponges range from a few millimeters to hundreds of millimeters in size. The outer surface is covered with pores of two types; incurrent (ostia) usually microscopic, and excurrent (oscula), up to a centimeter in diameter.

Most sponges possess calearsous or siliceous spicules and/or a protein material, spongin. The spicules embedded in the spongin lend structural support. Based on size, the spicules are initially classified as megascleres or microscleres. Sponge size, color, morphology and spicule types are important identification characters.

CLASS DEMOSPONGIAE

ORDER HADROMERIDA

FAMILY CLIONIDAE (Figure 223)

PHYLUM COELENTERATA (CNIDARIA) (Figures 224-227)

Defintion: Body with radial or biradial symmetry; tentacle bearing and with nematocysts. May be a sessile polyp or free-swimming medusa. A gastrovascular cavity is present with a single opening serving as both mouth and anus. Two tissue layers, the epidermis and the gastrodermis, separated by a mesoglea, which may exhibit some cellular organization or serve primarily as a support matrix. Many species are polymorphic having a polypoid and medusoid stage.

The Coelenterata, popularly known as jellyfish, anemones, corals, hydras and hydroids, is a large diverse phylum. Its members are exclusively aquatic and primarily marine. Single individuals as well as colonial forms are represented. Some species may exhibit only the polypoid or medusoid form while other species exhibit both forms during their life cycle.

In spite of the fact that there is a large number of species contained within this phylum, relatively few representatives were collected from Tampa Bay. The bay benthic substrate is not generally suitable for attachment of sessile organisms such as hydroids. Areas most likely to exhibit a sessile attached fauna, such as pilings, seawalls, breakwaters and mangrove roots, were not sampled since the emphasis of the study was on the open expanses of bay bottom. Thus the number of species which were found in relatively small. Specimens were not identified to the species level because of their rarity of occurrence (hydroids) and the necessity of obtaining microscopic sections, as for the anemones.

CLASS HYDROZOA (Figure 224) ORDER ATHECATA ORDER THECATA

Most of the members of this class have a sessile polypoid stage with many producing a free medusae stage. The group is extremely diverse. Colony organization, presence or absence or a chitinous covering, stem annulations, structure of the hydrothecae, and arrangement of gonophores, are some of the systematically important features.

CLASS ANTHOZOA (Figures 225-226)

ORDER ACTINIARIA ORDER CERIANTHARIA

The anemones are solitary and without internal calcareous spicules or an external skeleton. Aborally there is an adherent base or as in the burrowing forms a rounded tapered end. Orally there is a ring or rings or tentacles. Species identification in this group is based on characters such as: the development of internal mesentaries, the structure of the oral sphincter, the basal musculature and the types of nematocysts present.

PHYLUM PLATYHELMINTHES (Figures 228-229)

CLASS TURBELLARIA - Free living flatworms

Definition: Flatworms are soft-bodied, dorsoventrally flattened and unsegmented; they lack a coelom and definitive anus and have a ventral mouth either near midbody or near the anterior end.

ORDER POLYCLADIDA

The Polycladida are most commonly found non-parasitic flatworms of benthic studies. They are difficult to identify to species level while alive or without using special fixing and clearing procedures, followed by sectioning. However, some species can be tentatively identified using externally visible characteristics.

Two species were commonly enocuntered in the area of collection, although never in large numbers.

PHYLUM RHYNCHOCOELA (NEMERTEA) (Figures 230-231)

Definition: The Rhynchocoela are bilaterally symmetric, acoelomate, non-segmented and are dorsoventrally flattened or cylindrical. The body is soft and covered by glandular cilia which makes the surface slimy. They have an eversible proboscis, a complete digestive system, a flame cell excretory system, a brain and lateral nerves. The sexes are usually separate.

Most nemerteans are marine bottom dwellers in shallow water. Taxonomic distinctions are based primarily on the structure of the proboscis and the location of the longitudinal nerves with respect to thee muscle layers. Species identification is therefore difficult and, if a stain has been used to facilitate sorting of samples, identification is not possible. The proboscis of a nemertean is often extruded in fixed specimens. This feature along with the lack of any appendages, no segmentation, the frequent presence of several ocelli (eyes) and the usual slimy mucus coating, usually enables the investigator to recognize a nemertean. Nemerteans were common but never particularly abundant in the study area. Figure 230 is a basic diagram of a nemertean while Figure 231 is a photo of preserved specimens.

PHYLUM NEMATODA (Figure 232)

Defintion: The Nematoda, or round worms, have a slender, cylindrical, elongated body, usually tapered at both ends, and covered with a cuticle. They have no segmentation, cilia, or circular muscle fibers. A true digestive tract a pseudocoel are present. The sexes are separate.

The Nematoda are comprised of many free living and parasitic species occupying marine, fresh water, and terrestrial habitats. They are the most numerous and widespread of all multicellular animals occurring virtually everywhere on earth. The marine forms account for the greatest number of species. Generally the greatest numbers of nematodes occur in areas of least osmotic stress, with brackish and estuarine waters harboring fewer species than more saline waters. Most nematodes are small, less than 1 mm, and are usually considered to be a component of the meiofauna. Relatively large nematodes, up to several millimeters in length, were frequently collected from Tampa Bay.

Nematodes are difficult to identify and their classification is still unstable. Furthermore, there are relatively few workers dealing with marine nematodes. The Bibliography should be consulted for further reading.

PHYLUM PHORONIDA (Phoronid worms) (Figure 233)

Definition: Unsegmented, wormlike, tube-dwelling animals with a lophophore; they have a recurved digestive tract with the anal opening near the mouth. A relatively small phylum of approximately 18 species.

PHYLUM BRACHIOPODA

Definition: Exclusively marine or estuarine, bivalved animals with a lophophore. One valve is cemented to the substratum, or attached by a fleshy pedicle, or the animal is burrowing with an elongated pedicle slightly enlarged distally and used as an anchor.

Brachiopods may initially be mistaken as bivalve molluscs. However, there is no relationship between the groups other than the similarity of the external shell. The internal anatomy is different and the shell valves are arranged dorsal and ventral rather than laterally as in the Bivalvia. Most brachiopods inhabit offshore waters. There is a common estuarine representative of the family Lingulidae which occurs with a patchy abundance along the Southeast U.S. Coast and the Gulf coast of Florida.

CLASS INARTICULATA (Figure 234)

ORDER LINGULIDA

PHYLUM SIPUNCULA (Peanut Worms)

Definition: Fleshy, wormlike animals without segmentation or appendages; consisting of two discernable body regions. Anteriorly, there is a narrow retractile introvert followed by a thicker trunk. The introvert has a terminal mouth encircled by tentacles. The anus is located anteriorly on the dorsal side of the trunk.

The sipunculids are composed of about 300 species of marine animals. They are exclusively benthic. They are wormlike and range in size from 200-600 mm. The body surface may be smooth or covered with various epidermal structures such as papillae, holdfasts or hooks. The introvert is often completely retracted in preserved specimens, which in turn may alter the shape of the trunk. Sipunculids may be sedentary, burrowers or live within discarded gastropod shells. Specimens of sipunculids are rarely obtained in the Tampa Bay area and there is very little information in the literature of their occurrences.

FAMILY GOLFINGIIDAE (Figures 235-236)

PHYLUM HEMICHORDATA (Acorn Worms)

Definition: Relatively large wormlike animals without appendages; with a three-part body; an extensible proboscis, separated by the cylindrical collar from the long trunk.

Entire animals are seldom collected with light-weight, remote sampling gear. Hemichordates live in long U-shaped burrows in fine sand or mud and can retreat deep into the substrate if disturbed. Most frequently, specimens are obtained lacking some portion of the trunk. Minute juveniles are sometimes collected which differ slightly in appearance from adults.

CLASS ENTEROPNEUSTA

FAMILY HARRIMANIIDAE (Figure 237)

PHYLUM CHORDATA

Most chordates are vertebrates. However, two subphyla, the Urochordata and Cephalochordata, lack a backbone but exhibit chordate characteristics at some time during their life cycle. These characteristics are a notochord, a dorsal hollow nerve cord and pharyngeal clefts. These animals little resemble other chordates.

SUBPHYLUM UROCHORDATA (Tunicates)

Comprised of about 1300 species, most urochordates are tube or barrel-shaped and are attached to the substratum in some manner. These are three classes of urochordates: the Ascidiacea, Thaliacea, and the Larvacea. The ascidians are the most numerous and common, the other two classes living a specialized planktonic existence.

CLASS ASCIDIACEA (Sea Squirts) (Figures 238-239)

The ascidians are sessile tunicates which are quite common worldwide and most abundant in the littoral zone, attaching primarily to firm substrates, rocks, pilings, and boats with some species being found in mud or sand. They are hermaphroditic, with the number, shape and placement of gonads being an important taxonomic characteristic. There are two siphonal openings in the tunicate test, the incurrent, branchial siphon and the excurrent atrial siphon. The branchial siphon opens into the branchial chamber which is separated from the atrial or peribranchial chamber by rows of stigmata (gill slits) some times called the pharyngeal basket. Figure 238 diagramatically depicts some of the important features of a tunicate.

ORDER PLEUROGONA

FAMILY MOLGULIDAE (Figure 239)

Two species from this family were collected from Tampa Bay. They are both very similar in external appearance. Only *Molgula occidentalis* is pictured here. *Bostrichobranchus pilularis* Verrill, 1871. St. Lawrence estuary to both sides of Florida. Maximum length 3.5 to 4.0 cm. Lives unattached, burried in mud or sand. Globular in shape, with a thin, nearly transparent integument and a single bean-shaped gonad on the left side of the body. The branchial sac is without folds, the stigmata are spiral. Branchial siphon six-lobed, atrial siphon four-lobed. A bean-shaped kidney is present, attached to the right posterior part of the mantle.

PHYLUM PORIFERA

CLASS DEMOSPONGIAE

ORDER HADROMERIDA

FAMILY CLIONIDAE

Fig. 223. Cliona celata - Grant, 1826. Encrusting, frequently emergent from riddled mollusc shells, forming crusts with scattered wartlike oscula (A). They may also be massive without a trace of the original host shell. Microscleres are absent and the megascleres are one one type (B). The color is usually bright yellow.

PHYLUM COELENTERATA (CNIDARIA)

CLASS HYDROZOA

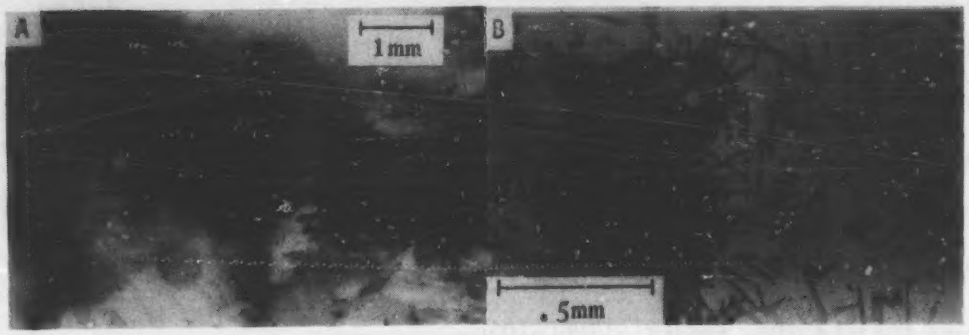
Fig. 224. Hydroid specimens representing various families: A. Campanularidae, B. Campanulinidae, C. Eudendriidae, D. Clavidae. ORDER THECATA: A,B; ORDER ATHECATA: C,D.

CLASS ANTHOZOA

ORDER ACTINIARIA

TRIBE ANTHANARIA - Burrowing Anemones
FAMILY EDWARDSIIDAE
Fig. 225. Edwardsi sp.

PLATE 47 (Figures 223-225)



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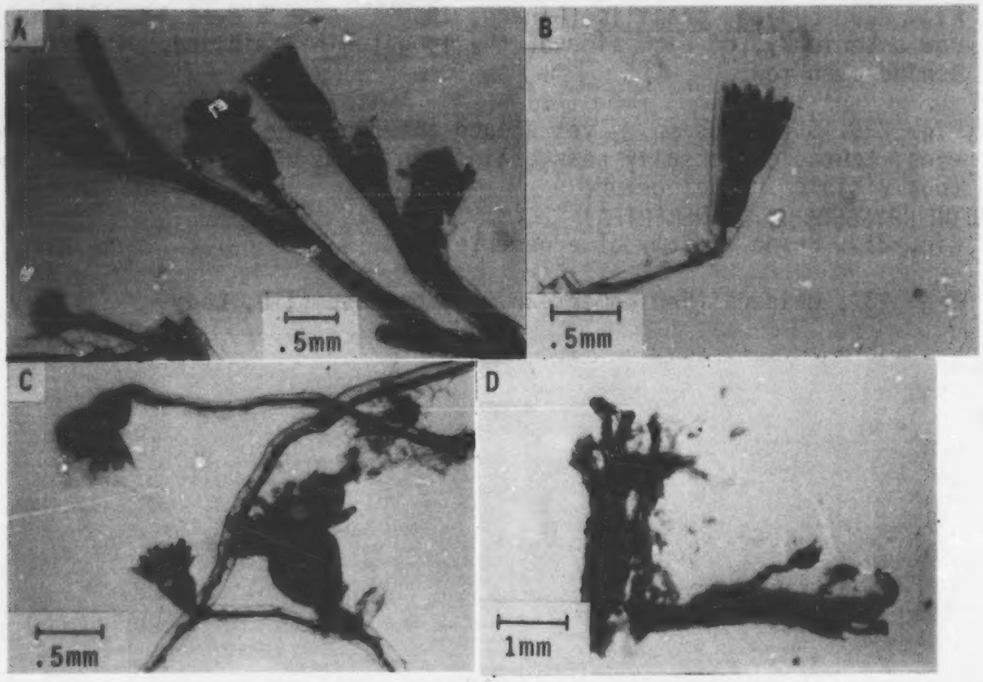
A
.5mm
B
.5mm
C
.5mm
D
1mm

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225

TRIBE THENARIA
FAMILY ACTINOSTOLIDAE

Fig. 226. A. *Paranthus* sp. B. An unidentified species.

ORDER CERIANTHAIRA

Fig. 227. *Cerianthus* sp.

PHYLUM PLATYHELMINTHES CLASS TURBELLARIA

ORDER POLYCLADIDA FAMILY STYLOCHIDAE

Fig. 228. *Euplana gracilis* (Girard, 1850). 4 or 5 eyes (ocelli) in a row anteriorly, on each side of the longitudinal midline, plus 2 more behind each row.

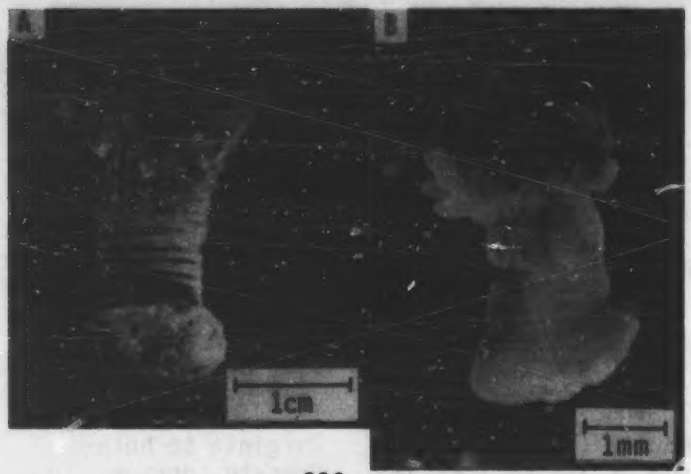
Fig. 229. *Stylochus* sp. Eyes around anterior margin, plus 2-4 central eyes; tentacles dorsally near brain; tentacles often difficult to see (not visible in photograph).

PHYLUM RHYNCHOCOELA (NEMERTEA)

Fig. 230. Basic anatomy of a nemertean

Fig. 231. Unidentified nemertean. P, proboscis; B, body

PLATE 48 (Figures 226-231)



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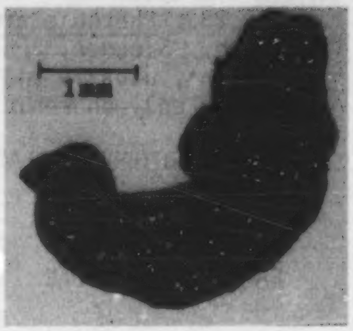

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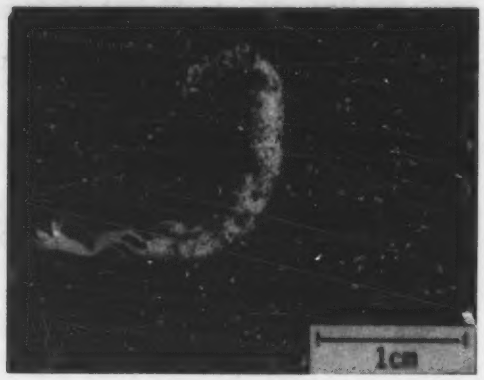

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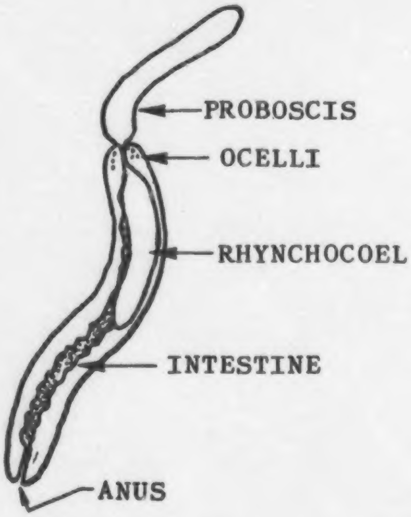
PROBOSCIS
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INTESTINE
ANUS

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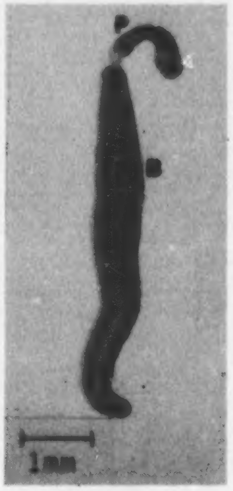


231

PHYLUM NEMATODA

Fig. 232. Unidentified large nematode commonly collected from Tampa Bay.

PHYLUM PHORONIDA

Fig. 233. Phoronis architecta - Andrews, 1890. Up to 50 mm in length. Slender. Posterior end slightly swollen. Lives in a straight, usually rigid cylindrical tube constructed of sand. This was the only phoronid species collected in the study area.

PHYLUM BRACHIOPODA CLASS INARTICULATA

ORDER LINGULIDA

FAMILY LINGULIDAE

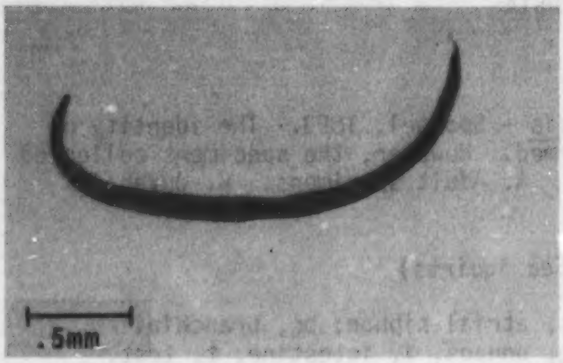
Fig. 234. Glottidia pyramidata (Stimpson, 1860). Virginia to both sides of Florida. To 25 mm in length. Fragile, elongate, dorsoventrally flattened shell, with a long fleshy pedicle arising from the ventral valve at the posterior end. Setae rim the shell margins, being longest at the anterior margin. The shell lacks a hinge, being held together by muscles only. Color creme to yellow. A. Adult specimen. B. Juvenile at settling stage.

PHYLUM SIPUNCLA FAMILY GOLFINGIIDAE

Fig. 235. Phascolion strombi - Montague, 1804. Previously reported from Nova Scotia to North Carolina. Length about 16 mm in coiled position. This specimen was found occupying a gastropod shell, which modified the body form. Trunk with scattered chitinized denticles.

Fig. 236. Unidentified specimens of sipunculids.

PLATE 49 (Figures 232-236).



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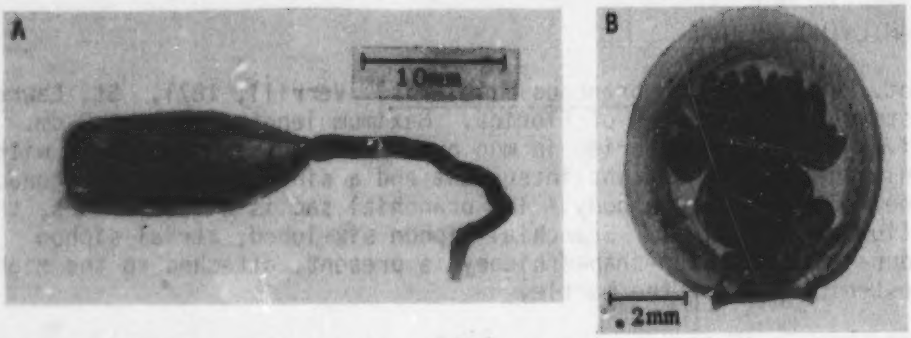

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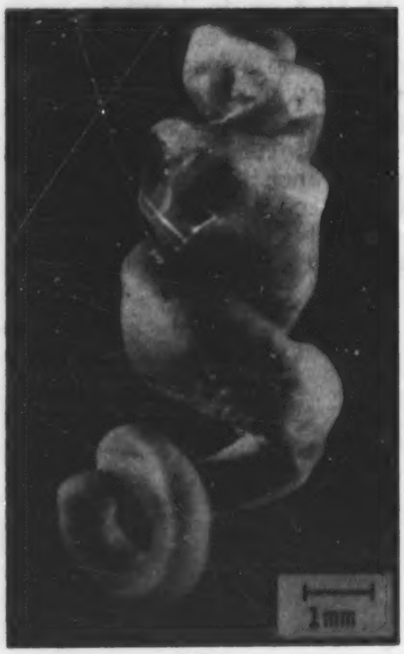

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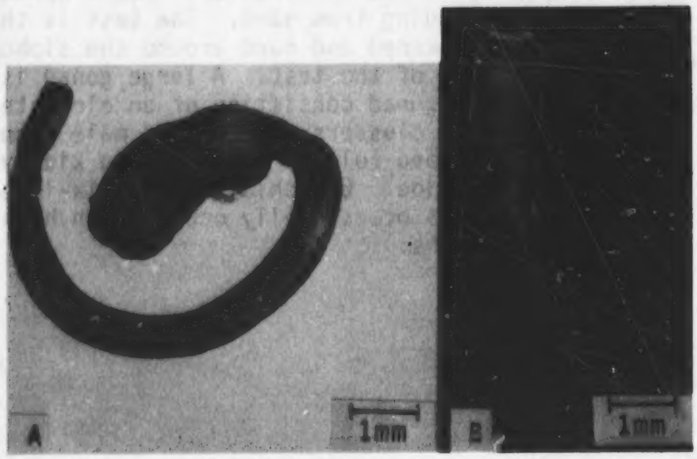


236

PHYLUM HEMICHORDATA CLASS ENTEROPNEUSTA

FAMILY HARRIMANIIDAE

Fig. 237. *Stereobalanus canadensis* - Spengel, 1893. The identity of this hemichordate was not confirmed. However, the specimens collected closely resembled *S. canadensis*. A. Adult specimens. B. Juvenile specimens.

PHYLUM CHORDATA CLASS ASCIDIACEA (Sea Squirts)

Fig. 238. Schematic tunicate, as, atrial siphon; bc, branchial chamber; bs, branchial siphon; g, gonads, i, intestine; t, test.

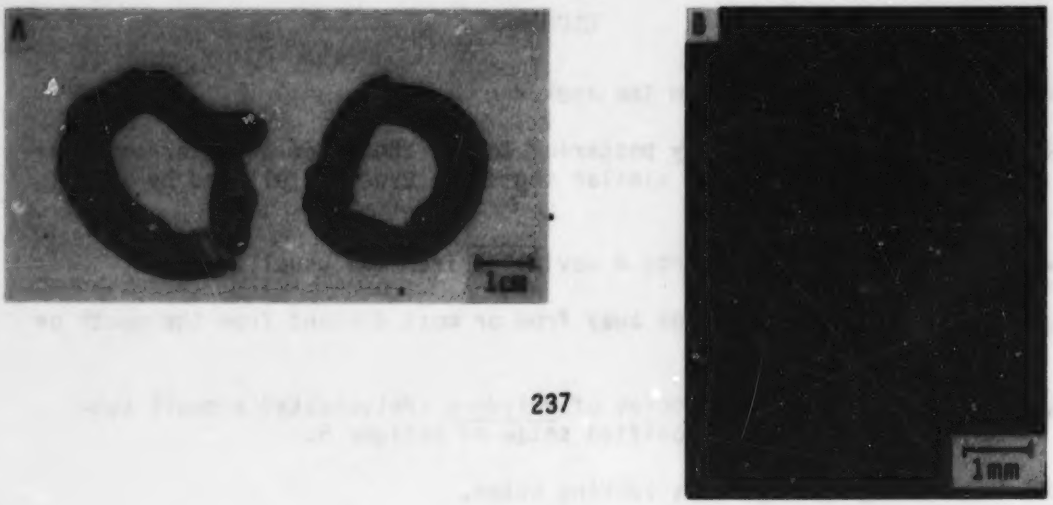
ORDER PLEUROGONA

FAMILY MOLGULIDAE

Not. Fig. *Bostrichobranchus pilularis*. Verrill, 1871. St. Lawrence estuary to both sides of Florida. Maximum length 3.5 to 4.0 cm. Lives unattached, burried in mud or sand. Globular in shape, with a thin, nearly transparent integument and a single bean-shaped gonad on the left side of the body. The branchial sac is without folds, the stigmata are spiral. Branchial siphon six-lobed, atrial siphon four-lobed. A bean-shaped kidney is present, attached to the right posterior part of the mantle.

Fig. 239. *Molgula occidentalis* - Traustedt, 1883. North Carolina, both sides of Florida and the West Indies. Up to 6 cm in length. Body oval to nearly circular. Found buried with apertures and part of body protruding from sand. The test is thin and semitransparent, but may be thickened and hard around the siphons. Sand grains adhere to the surface of the test. A large gonad is present on each side of the body, each gonad consisting of an elongate, curved, tubular ovary bordered by clusters of branched male glands. Branchial sac with six well-developed folds. Large oblong kidney connected to the mantle on the right side. Branchial siphon six-lobed atrial siphon four-lobed. This species occasionally occurred in high-density patches during the winter months.

PLATE 50 (Figures 237-239)



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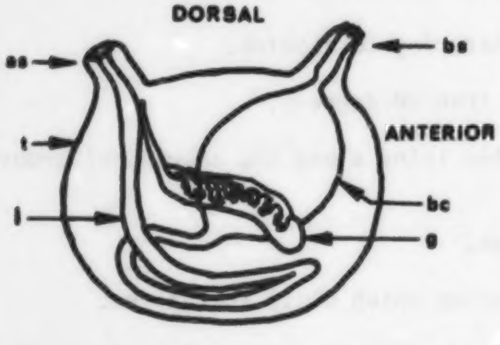
DORSAL
as
bs
t
ANTERIOR
bc
i
g

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SECTION 10
GLOSSARY

abapical: Directed away from the apex.

abdomen: Portion of the body posterior to the thorax or anterior-most portion; often composed of similar segments; usually followed by a tail region.

aberrant: Abnormal, different; a deviation from the usual type.

aboral: Pertaining to an area away from or most distant from the mouth or oral region.

accessary tooth: In some species of Polydora (Polychaeta) a small subterminal tooth on the modified setae of setiger 5.

achaetous: Also asetigerous; lacking setae.

acicle: In the crustaceans, an antennal scale which is reduced to a spine.

aciculum (acicula): A thick, chitinous rod embedded in and supporting one or both parapodial lobes. Acicular "setae" are thick and projecting.

actinal: In a radially-symmetrical animal, that part which contains the mouth (or anus) and from which arms or tentacles radiate.

acuminate: Sharply pointed; ending or tapering to a point.

acute: Sharp; a point or angle of less than 90 degrees.

adambulacral: Any of a series of ossicles lying along the ambulacral grooves of starfishes.

adapical: Directed toward the shell apex.

adductor muscles: In a bivalve, the muscles which close the valves.

afferent channels: In crustaceans, openings through which water passes to the gills.

aileron: Accessary jaw plate characteristic of the polychaete family Glyceridae.

alimbate: Without a limbus; not limbate; for polychaetes describes smooth capillary setae.

ambulacrum: One of the radial furrows of an echinoderm ray along which run the principal nerves and water vascular tubes, and which usually bear rows of tube feet that protrude from regular pores.

amorphous: Without a definite form or shape.

ampulla: A muscular bulb-like end of a tube foot in the echinoderms.

anal: Near or pertaining to the anus or posterior opening of the digestive tract.

anal cirrus (cirri): A long, slender process(es) arising from the pygidium.

annulated: With a serially-ringed appearance.

antenna (antennae): Slender sensory projections arising from the anterior-most or head region; long or short, segmented or unsegmented, paired or unpaired.

antennal spine: In crustaceans, a spine immediately below the orbit adjacent to the antenna base.

antennule: The second antenna of crustaceans, usually smaller.

anterior: Pertaining to or near the front or forward end.

anterolateral teeth: Small ridges (teeth) along the margin of a decapod's carapace between the orbit and the lateral spine.

aperture: A space or gap; the opening into the first whorl in the shell of a gastropod, usually more or less round or ovoid.

apex: The tip of the spine of a snail shell; the point or tip.

apical: Pertaining to the tip or apex.

apodeme: A cuticular ridge, process, or any other ingrowth of an arthropod skeleton.

apodous: Without parapodia.

apophysis: A bony process; outgrowth or swelling.

appendix interna: In some crustaceans, a small, hooked branch on the medial side of the pleopodal endopodite which interlocks with the other endopodite when swimming.

appendix masculina: In some crustaceans, the accessory male organ located medially between the endopodite and appendix interna on the second pair of pleopods.

arborescent: With tree-like branching.

archetype: See prototype.

arcuate: Arched or curved as a bow.

areolation: In crustaceans, the marking of various areas of the carapace by furrows, ridges, or other offsets of contour.

aristate: In the Polychaeta, setae that terminate in a long, slender spine or spines.

arthrobranch (arthrobranchia): In some crustaceans, a gill which is attached to the joint area between the coxa of an appendage and body wall.

asetigerous: Also achaetous; lacking setae.

asexual: Without sex as in any reproduction not involving gametes.

autotomize: To shed or cast off easily or deliberately.

autotomy: Self amputation.

auxiliary claws: In the Pycnogonida, a small spine-like projection at the base of the dactyl.

axial: In the same direction as the axis; (in a snail) from apex to base; in the plane of the axis.

base: The bottom; in snails, the end opposite the apex; in bivalves, the margin opposite the hinge margin.

basicerite: A spine on the dorsal or dorso-lateral side of the basis of an antenna.

basipodite: Basipod; distal of the two segments composing the protopodite of a biramous appendage.

basis: See also basipodite; second segment of a leg of maxilliped.

beaded: Raised, usually smooth projections or bumps; often present on mollusc shells at costae intersections.

beak: Also umbo; the earliest formed part of a bivalve shell near the hinge.

benthic: Pertaining to the benthos.

benthos: Collective term used to refer to all the plants and animals living on the bottom of a lake or sea.

biacicular: In the Polychaeta, having acicula in both the notopodial and neuropodial branches.

biarticulate: With two joints or divisions.

bidentate: With two teeth.

bifid: Divided into two parts; forked; with two branches.

bifurcate: Terminating in two prongs, usually longer and more widely separated than bifid.

bilimbate: In the Polychaeta, simple setae with two winglike, flattened margins, often making the setae v-shaped in cross section.

bilobate: With two lobes.

biradial symmetry: A radially-arranged organism in which the number of repeated parts is only two; bilateral symmetry superimposed on a fundamental radial symmetry.

biramous: Two-branched; in the Polychaeta, refers to having two branches of the parapodia.

bivalve: With two valves; common term applied to pelecypod mollusc with two shelly valves, e.g. a clam or mussel.

boathooks: Also crochet setae and falcate hooks; stout sickle-shaped spines found in some species of polychaetes.

body whorl: In a snail, the last and usually largest turn.

branchia (branchiae): Respiratory structures, especially in the polychaetes; a gill.

branchiocardiac groove: A furrow on the dorsal surface of the carapace of many decapod crustaceans separating the branchial and cardial regions.

branchiostegal spine: Spine on the anterior edge of the carapace of some crustaceans, immediately below the branchiostegal groove.

branchiostegite: Lateral expanded portion of a crustacean carapace which forms a gill cover and gill chamber.

buccal: Pertaining to the mouth or that portion of the body containing the mouth.

buccal cavity: Mouth cavity, just inside the mouth opening.

byssal gape: An opening on the ventral margin of bivalves through which projects the byssus.

byssus: Threadlike chitinous fibers secreted by the foot of a bivalve which serves as an anchor.

calcareous: Composed of calcium carbonate; hard, shelly material.

callus: A thickening of calcareous or enamel-like material usually around the aperture or umbilicus in snails.

canal: A tubular prolongation; in snails; a siphonal and/or anal canal may be present.

cancellate: Criss-crossing sculpture lines usually intersecting at right angles.

capillary setae: Descriptive of long, slender, tapering setae of polychaetes.

cardinal teeth: The largest, strongest teeth of a bivalve hinge usually located just below the beaks.

carina: Elevated ridge or keel.

carnivore: Any animal that feeds mainly on living animal matter.

carnivorous: Being a carnivore.

carpopodite: Also carpus; the fifth segment of the pereiopod in most crustacea.

carpus: See carpopodite.

caruncle: Any fleshy outgrowth or protuberance; in the polychaetes, a ridge or process on or following the prostomium.

cephalic: Pertaining to the head or anterior end.

cephalon: Also cephalic; the head or anterior region and its attached parts.

cerate: External respiratory outgrowths on the dorsal surface of some snails.

ceratophore: Also cirrophore; base joint of an antenna; base of a cirrus.

ceratostyle: Also cirrostyle; distal joint of an antenna; distal joint of a cirrus.

cervical groove: A groove or series of transverse grooves running across the carapace, marking the general separation of the head and thoracic areas of many decapod crustaceans.

chela (chelae): Arthropod appendage modified to form a pincer or claw; short, broad sponge spicule with recurved hooks, plates or flukes at each end.

chelate: Possessing claws or pincers.

chelipeds: First pair of thoracic legs immediately behind the maxillipeds in crustacea, often bearing chelae.

chevron: A v-shaped chitinized jaw-piece at the base of the proboscis of some polychaetes.

chitin: A tough resistant compound forming the hard covering of arthropods; also found sparingly in certain structures of other animals.

chitinous: Composed of chitin.

chondrophore: A pit or spoonlike shelf, in the hinge of a bivalve, into which fits a chitinous cushion or resilium.

cilia: Plural of cilium; short, hairlike processes on the surface of a cell, usually numerous.

cirriform: Slender and cylindrical; filamentous.

cirrus: A long, slender, usually cylindrical, sensory projection.

clavate: Club shaped; with an inflated base and slender tip.

coelom: Body cavity formed between layers of mesoderm and lined with epithelium of mesodermal origin.

coelomate: Having a coelom.

collar: A fold or flap of tissue encircling or rimming.

colonial: Any species of animal that lives in groups of separate, attached, or incompletely separated individuals.

columella: Axial column or pillar around which the whorls of a snail shell form their spiral circuit.

commensal: One of the members of a commensalism association.

commensalism: Close associations between two different species where one member derives a benefit and the other member neither benefits nor suffers.

companion setae: In the Polychaeta, small, simple setae which accompany or alternate with larger or modified setae.

composite setae: Also compound setae; jointed setae; composed of two or more joined parts.

compressed: Flattened.

concentric: One within the other; non-intersecting curved lines with a common center.

condyle: Knoblike, articulating surface.

conic: Cone shaped; conical.

conspecific: Pertaining to the same species; members or groups of the same species.

cord: In molluscs, a coarse, rounded spiral or transverse linear sculpture on the shell surface; smaller than costae.

corneous: Horny or hornlike material.

costae: A rib or ridgelike structure.

coxa: See also coxopodite; first segment of an arthropod leg which articulates with the thorax.

coxopodite: See also coxa; basal segment of the pereiopod of many crustacea; the basal segment of the two segments of the protopodite of a biramous appendage.

crenulate: Notched or scalloped around the margin.

crotchet: Long setae with one or more terminal teeth at an angle to the shaft.

dactyl (dactylus or dactylopodite): Digit, as a finger or toe; the moveable finger of a cheliped.

deciduous: Having a tendency to fall off easily.

deck: A septum or sheet of shelly substance in the umbonal region of some Gastropoda.

denticle: A small, toothlike projection.

denticulate: Toothed; with numerous projections.

detritus: Particulate debris of organic or inorganic origin.

dextral: "Right handed"; turning from left to right; clockwise.

digitform: Finger shaped.

dimorphism: The occurrances of two distinct morphological types in a population.

discoid: Disc shaped; in the Gastropoda, whorls coiled in one plane.

distal: Situated away form the base or point of attachment.

dorsal: Pertaining to the back or upper surface.

efferent channels: Channels through which water leaves the gills of a crustacean, usually opening at the sides of the endostome.

elongate: Longer than wide.

elytron (elytra): Also elytrum; in the Polychaeta, a flat, scalelike modified dorsal cirrus.

encrusting: To cover; a layer or hard coating.

endognath: The principal branch of a maxilliped.

endopodite: Also endopod; the medial ramus of a biramus appendage.

endostome: In the branchyuran crustacea forms the palate of the epistome.

entire: Smoothly arched or curved; without interruption.

epibranchial region: The area of a crab carapace which is situated behind the orbit and above the metabranchial region.

epidermis: Outtermost layer(s) of the integument.

epifauna: The fauna that lives exposed on the surface.

epigastric lobes: Regions or lobes near the upper medial part of the abdomen.

epimere: Lateral portion of the body somites between the tergum and the insertion point of the appendages.

epipodite: Gill separator; narrow outgrowth attached at or near the base of the thoracic appendages in some decapods which keeps the gills separated.

epistome: Small flap which covers the mouth of some Bryozoa; in some crustaceans, a plate which lies between the mouth and the base of the second antennae.

epitoke: A modified reproductive stage of the Polychaeta.

equilateral: In bivalves, the anterior and posterior ends of equal size.

equivalve: In bivalves, each valve equal in size and shape.

escutcheon: In bivalves, a long, depressed area dorsally just porterior to the beaks.

exognath: Secondary, or outer branch of a maxilliped.

exopodite: Also exopod; lateral ramus of a biramous appendage.

eye tubercle: A raised projection which supports the eye.

facial tubercle: A conspicious lobe or process on the anterior portion of the prostomium of some polychaetes.

falcate: Being distally hooked and usually blunt.

falciger: Setae which are distally blunt and curved.

fascicle: A bundle or group of setae.

fasciole: A band of color; in gastropods, formed by successive growth lines on the edge of a canal.

filiform: Long and slender; threadlike.

fingers: Also digits; narrow blades of the claw end of a cheliped.

flammulations: Flame-shaped spots of color.

foliaceous: Shaped like a leaf.

foot: A muscular portion of a mollusc used for locomotion.

front: On a crab, that anterior portion lying between the orbits.

frontal antenna: Anteriormost antenna.

frontal teeth: Teeth found on the front margin of the carapace, exclusive of the inner orbital teeth.

fusiform: Spindle shaped; cigar shaped; being wide in the middle and tapering at both ends.

gamete: A male or female reproductive cell.

gap (gaping): A space; in bivalves, the valves not closing completely.

gastric region: In the crab carapace, a large median area bounded by the cervical suture, the hepatic regions and the front orbital regions; divisible into the following subregions: epigastric, protogastric, mesogastric, metagastric, and urogastric.

gastrodermis: A layer of cells which lines the gastrovascular cavity of the coelenterates, the ctenophores, and the platyhelminthes.

genticulat: Bent or sharply curved.

gill: Aquatic respiratory organ, usually a thin-walled projection; also see branchia.

glassy: Like glass; hard, very shiny surface.

globose: Globe or sphere shaped; also globular.

gonophores: In the coelenterates, an asexual bud formed during the hydroid stage which produces gametes or develops into medusae.

granulated: A rough surface; as covered with grainlike bumps.

growth lines: Lines on a shell surface indicating periods of reduced growth rate, denoting a former position of the margin.

gyrus (gyri): A convoluted ridge between grooves.

habitat: The specific place where a plant or animal lives.

hand: In reference to the crustacea, also chela; propodus and dactyl of the cheliped.

harpoon setae: Pointed, stout setae with barbed tips.

hemogomph articulation: Asymmetrical articulation occurring at a nearly right angle to the long axis of the basal shaft; refers to a type of compound setae found in the Polychaeta.

hepatic regions: In the decapod crustacea, small, subtriangular, anterolateral region between the branchial and gastric regions; margin of the carapace or the orbit in the Branchyura.

hepatic spine: Spine on the hepatic region.

herbivore: An animal that relies primarily on the plant matter for its food.

herbivorous: Being an herbivore.

hermaphrodite: An individual possessing both male and female reproductive organs.

hermaphroditic: The condition of being a hermaphrodite.

heterogomph articulation: Articulation at an oblique angle to the long axis of the basal shaft; refers to a type of compound setae found in the Polychaeta.

hinge: Where the valves of a bivalve are joined; a flexible joint.

holotype: The original type; a single specimen upon which a species description is based.

homogomph articulation: Articulation at a right angle to the long axis of the basal shaft; refers to a type of compound setae found in the Polychaeta.

hooded setae: Setae distally covered with a membrane.

hook: Bent or recurved so as to hold or grasp; in the Polychaeta, refers to stout, blunt setae which may be distally curved and dentate; see also uncini.

hyaline: Thin, membraneous; transparent; clear.

hydroid: Any coelenterate of the class Hydrozoa; the polyp form of coelenterates; may be solitary or colonial and are usually attached.

hydrotheca: In certain hydrozoans, a thin, vaselike exoskeleton which surrounds the individual feeding polyps.

hypoplax: An accessory piece of shell between the valves of some burrowing clams.

imbricated: Overlapping at the margins; shinglelike.

incised: Sculptured with one or more sharply cut grooves.

incurved: Curved in; crooklike.

inequilateral: In bivalves, one end of the shell not the same size or shape as the other.

inequivalve: In bivalves, one valve larger or more complex than the other.

infauna: Animals that spend part of all of their lives burried beneath the sediment.

inferior: Ventral-most; the lowest.

inferomarginal: Pertaining to the lower margin or edge.

inflated: Swollen, distended, or rotund.

intercoastal: Spaces between the costa.

interpodial: Connecting or located between two successive parapodia.

interradial: Of or relating to an interradius.

interradius (interradii): One of the five general areas on the surface of an echinoderm between the five areas (radii) which bear the tube feet.

interramal: Located between the notopodial and neuropodial lobes of the parapodium.

ischium: Also ischiopodite; third segment of the pereiopod in most malacostracan Crustacea.

keel: A prominent spiral ridge usually marking a change of slope in the outline of a gastropod shell.

lamella (lamellae): Any thin platelike structure; fleshy lobes.

lanceolate: Elongated and lance or spear-shaped.

lappet: Small flap or fleshy process.

lateral: Near the side(s) of the body; located away from the midline.

lateral peristomial wings: Thin, lateral elongations of the peristomium of some polychaetes which may overlap a portion of the prostomium.

lateral prostomial horns: Prominent lateral projections of the prostomium of certain polychaetes.

lateral teeth: Hinge teeth lying to either side of the cardinal teeth.

ligament: A band of tough, brown elastic material which joins the dorsal margins of a bivalve; usually visible externally.

ligule: Small finger-shaped lobe of a polychaete parapodium.

limbate: Simple setae with a blade-like flattened margin.

limbus: The blade-like portion of a limbate setae.

lips: In gastropods, the margins of the aperture.

lobe: A fleshy projection, usually flattened.

longitudinal: Direction of the longest diameter; in snails, the same as axial.

lophophore: Horseshoe-shaped, three-part, coiled or variously shaped, feeding apparatus bearing numerous ciliated tentacles; in Bryozoa, Brachiopoda, and Phoronida.

lunule: A heart-shaped area anterior to the beaks of bivalves, set off by a difference in sculpture.

macrofauna: Refers to animals that are retained on a sieve with a mesh of 0.5 millimeter, or sometimes 1.0 millimeter.

madreporite: A sieve-like porous plate on the surface of most echinoderms (internal in the Holothuroidea); regulates the flow of fluid between sea water and the water vascular system.

main fang: In polychaetes, refers to the large ventral tooth of a crotchet.

mandible: Third pair of appendages on the head of crustaceans usually modified for crushing or grinding; also the ventral pharyngeal jaw pieces of some polychaetes.

mantle: Extension of the body wall that usually secretes a shell.

manubrium: A large process protruding from the center of a medusoid coelenterate; a swollen process of certain hydrozoan polyps which bears the proctostome; in some polychaetes, refers to a swollen portion of the setae.

maxillae: One or two pairs of head appendages of a crustacean, used for handling food; the dorsal pharyngeal jaw pieces of some polychaetes.

median: Middle, at the midline or in the plane of the midline.

medusa: The free-swimming "jelly-fish" stage of many hydrozoan coelenterates.

meiofauna: Refers to animals whose greatest dimension is between .062 and 1.0 millimeter.

megascleres: The larger, supporting skeletal spicules of sponges.

merus: Also meropodite; the fourth segment of the pereiopod of most malacostracan crustacea.

mesentery: A thin supporting membrane or partition in the body cavity of many animals.

mesogastric lobe: Median division or subregion of the gastric region.

mesoglea: A supportive layer of thick or thin jellylike material between the epidermis and gastrodermis of coelenterates and ctenophores.

mesoplax: An accessory plate inside the shell of some bivalves.

metabranchial region: That region of the porcellanid carapace which is situated below the line anomurica and, therefore, not completely united with the main portion of the carapace.

metagastric lobe: Posterolateral subregion of the gastric region of a crab carapace.

metamerism: Segmentation; linear repetition of body parts with each segment (metamere) having a similar internal and external morphology.

metaplax: An accessory plate behind the umbones of some bivalves.

metastomium: In annelids, refers to main body region between the prostomium and the pygidium.

microfauna: Bacteria and small protozoa generally less than .062 millimeter.

microscleres: Small spicules scattered about in the mesenchyme of sponges.

moniliform: Beaded or beadlike.

mottlings: Marked with blotches, streaks or spots of various shades.

mucro: An abrupt, pointed tip, process, or toothlike structure.

mucus: Any viscous, slimy or lubricating secretion of a mucous gland.

multiarticulated: With more than one joint or articulation.

nacreous: Nacre, mother of pearl; an innermost lustrous layer of the shell of molluscs.

natatory: Adapted for swimming.

nematocysts: The "stingers" of jellyfish; a specialized defensive or offensive cell found in coelenterates consisting of a minute coiled thread contained in a capsule which, upon proper stimulation, is rapidly everted; the thread may be armed with barbs and often contain toxins.

neotype: A specimen selected as the type for a taxon after the original type has been destroyed or lost.

nephridial pockets: In some polychaetes, the recesses along the margins of the somites, between the notopodia and neuropodia, into which the nephridiopores open.

neuropodium: The ventral lobe or branch of a parapodium.

neurosetae: Setae of the neuropodium.

nodule: A small knob-like hump or projection.

notopodium: The dorsal lobe or branch of a parapodium.

notosetae: Setae of the notopodium.

nuchal: Pertaining to the neck; used to refer to sensory organs of polychaetes located dorsally on or near the prostomium.

nuclear whorl: In a snail shell, the first whorls formed during the egg or veliger stage; the apex.

nucleus: The center; in certain molluscs, the initial whorl or protoconch.

obcordate: Heart shaped with the notch apical.

obese: Very fat; stout.

oblique: Slanting; not perpendicular.

occipital: The posterior dorsal portion.

ocellus (ocelli): Eye of many types of invertebrates which detects light but does not form an image.

ocular: Pertaining to the eyes or light-sensory structures.

ocular peduncle: Stalk-like structure supporting the eyes.

operculum: Cover or lid; in snails, a shelly or horny plate attached to the foot and used to seal the aperture of the shell.

oral tentacles: In some polychaetes, the tentacles in the region of the mouth used with food gathering.

orbicular: Round or circular; spherical.

orbit: Cavity in the Arthropod carapace containing the eye.

orbital region: A narrow area bordering the orbit.

osculum (oscula): Main opening or pore on the surface of a sponge out of which water passes.

ossicles: Plates, spicules and rods composing the structure of the echinoderm skeleton.

ostium (ostia): In sponges, one of many small openings on the surface through which water currents flow inward.

outer lip: In snails, the margin of the aperture or body whorl.

ovate: Egg shaped.

ovigers: In pycnogonids, a pair of appendages of males used to carry the females' eggs.

palate: In crabs, the roof of the buccal cavity.

palea: In some polychaetes, strong, broad, usually flattened setae.

pallial line: In a bivalve shell, a faint line near the periphery of each valve, which indicates the point of attachment of the mantle to the valve.

pallial sinus: An indentation in the pallial line, often indicative of the location of the incurrent siphon.

palm: Proximal portion of propodus of a chela.

palmate: Divided, like the fingers of a hand or the fronds of a palm.

palp (palpi): Fleshy cylindrical or tapered projection of a sensory or food-gathering nature on the anterior end of polychaetes; in arthropods, a segmented or unsegmented projection of a head appendage, sensory in nature.

papilla: Any blunt, rounded or nipple-shaped projection.

paragnath: The lobes of the lower lip (metastoma) of some crustaceans; an accessory projection on the mandible of some decapod crustaceans; chitinous denticle on the proboscis of some polychaetes.

parapodia: In molluscs, a lobe-like extension of the foot which can be used for swimming or to envelop the shell; in polychaetes, a flat, lateral protuberance on each side of most segments; usually has two main parts, a dorsal lobe (notopodium) and a ventral lobe (neuropodium); often reduced or specialized for feeding, locomotion, and respiration.

parapodial ramus (rami): One of the divisions of the parapodium (dorsal or ventral) usually bearing setae, acicula or both.

parapodial torus (tori): Parapodial lamella that is low and ridgelike.

paratype: One of a number of specimens from which the holotype was selected.

parietal shield: A thickened projection or expansion of the parietal wall.

parietal wall: The area on the whorl of a snail near the columella and opposite the outer lip, often called the inner lip.

paxillae: Modified spines present in some echinoderms; consisting of calcareous rods with minute spinules at the tip.

pectinae: Comblike paragnaths present in some polychaetes.

pectinate: Comblike; the main stem having a row or rows of branches.

pedicle: Also pedicel; a small stalk or stalklike support; stalk of a brachiopod.

penicillate: Ending with a tuft of hairs.

pennoned: Long and streamer-like; teardrop or triangular shaped.

pentamerous: Divided into or consisting of five parts.

penultimate whorl: The next to the last whorl.

pereiopods: Paired appendages on most of the thoracic segments of the malocostracan Crustacea; usually modified for seizing and handling of food and locomotion.

periostracum: The outermost layer of a mollusc shell, composed of sclerotized protein.

peristomium: The first whole segment of most annelids which bears the mouth; also includes any segments fused to this segment.

pharynx: An anterior muscular portion of the digestive tract; often eversible and sometimes equipped with jaws or mandibles.

pinnate: Feather-like; having parts arranged on each side, as on a feather.

planorboid: In snails, discoid, flat, with the whorls in one plane.

pleurobranchia: In some crustaceans, gills attached to the lateral body wall dorsal to appendage articulation.

plicate: With small ridges or folds.

plumose: Feathery; hairy; having a tuft of terminal subdivisions.

podium (podia): Tube feet; in echinoderms, a short tubular external projection of the body wall located in the ambulacral groove, primarily used for locomotion and food gathering.

podobranchia: In some Crustacea, quills attached to the coxa of an appendage.

polymorphism: Two or more distinct morphological forms of a species.

polyp: A single individual of a colonial or solitary coelenterate.

post nuclear: In a snail; the whorls formed after the nuclear whorls.

posterior: Pertaining to the rear end; opposite or away from anterior.

posterior adductor: In a bivalve; a transverse muscle in the posterior portion which closes the valves.

postorbital groove: A groove on the carapace of a crab behind the orbit and usually parallel to the margin.

postsetal: Behind, posterior to the setae.

presetal: In front of, anterior to the setae.

proboscis: A protusible anterior part of the alimentary tract which is sometimes armed with special structures, and is used for feeding and/or as a sensory device.

propodium: Anterior part of the foot of certain molluscs, used to push aside sediment when crawling.

propodus: Also protopodite; the sixth segment of a pereiopod of most malacostracan crustaceans.

prosartema: Dorsal eye brush; in the penaeid crustaceans, a long, thin, ciliated lobe arising dorsally from the border of the first antennal segment.

prosoma: Anterior part of the body; the cephalothorax in certain arthropods.

prostomium: Anterior-most end of most annelids; above and anterior to the mouth, often with antennae and eyes; not a true segment.

protoconch: Embryonic shell of a gastropod.

protogastric lobe: Anterolateral lobes of the gastric region.

protoplax: An accessory plate of the hinge structure in some of the bivalve molluscs.

protopodite: Also protopod; peduncle of an appendage usually consisting of a coxal and a basal article.

protostome: Mouth; the single opening of the gastrovascular cavity of the Coelenterate, Ctenophora and Turbellaria, which serves as both mouth and anus.

prototype: Also archetype; primitive form regarded as being ancestral to other forms.

proventricle: A muscularized, glandular region of the anterior digestive tract found posterior to the pharynx in some polychaetes.

proximal: Situated toward or near a central point of reference at attachment.

pterygostomian region: Triangular area on the ventral surface of a carapace.

pterygostomian spine: Spine at anterolateral border of a carapace.

pubescent: Covered with setae or fine soft hairs.

punctate: With a granular or stippled appearance; with many minute dots, pits or depressions.

pustulate: Also pustulose; marked with small pustules; fine bumps or pimplelike projections.

pygidium: Caudal body region of certain crustaceans; the terminal or anal segment of annelids which is achaetous and not a true segment.

pyriform: Pear shaped.

radial: Branching out from a common center; developing uniformly around a central axis; in the bivalve molluscs, lines of color or sculpture fanning out from the beaks to the shell margins.

radiole: One of the main tentacles of the tentacular crown of some polychaetes.

radius (radii): One of the five general areas on the surface of an echinoderm which bears tube feet.

radula: A rasplike organ in the anterior part of the digestive tract of all molluscs, except the Pelecypods, and used to macerate food; in some groups, it can be protruded from the mouth for scraping or drilling.

ramose: Branched.

ramus: A branch or one segment of two branches, as in the appendage of a crustacean.

ray (rays): Any of the radiating parts of an echinoderm with the associated parts; the arm of a sea star; in bivalves, a band of shell coloration usually radiating from the beaks.

reniform: Bean shaped or resembling a kidney in outline.

resilium: Also resilifer; in a bivalve mollusc; a tough chitinous pad, residing in a chondrophore, or pit, along the inner hinge margin of a bivalve which causes the shell to open when the adductor muscles relax.

reticulated: Having the structure or appearance of a network; as crossing fibers, lines or ridges.

rhinophores: One of two tentacle-like projections on the dorsal surface of the head of certain opisthobranchs, especially nudibranchs.

rib: In molluscs; a long narrow elevation.

rostrum: A median, usually pointed process at the anterior end of the cephalothorax of many decapods; a snoutlike extension of the head.

rugose: Rough or wrinkled; lumpy.

sagittate: A subdistally widened setae.

scaphe: Flattened caudal appendage of the pectinariid polychaetes.

scaphocerite: Antennal scale.

sculpture: A pattern of raised or depressed markings.

scutum (scuta): Large, calcareous basal plates in the barnacle skeleton; the scuta, in combination with the terga, close off the feeding aperture.

secondary tooth: The second, usually smaller of two teeth; the first being the apical or primary tooth.

segment: Also somite; in the arthropods, the fundamental linearly arranged body subdivisions also known as somite and metamer; subdivision of an arthropod appendage.

septum: A wall, membrane, or partition separating two cavities or tissue masses; in molluscs, a calcareous plate.

sessile: Nonmotile; attached to a substrate.

seta (setae): Hairlike or needle-like chitinous projections in the arthropods and annelids; size and complexity vary greatly.

setiger: A segment (somite) carrying setae.

sheath: An envelope or covering; in the polychaetes, refers to a thin covering over the setae often causing the setae to appear limbate.

shoulder: In gastropods, the top or largest part of the whorl.

siliceous: Containing or composed of silica.

simple setae: Setae without a joint.

sinistral: Turning or growing in a counter-clockwise manner; "left-handed".

sinus: A space or cavity in living tissues.

siphons: In bivalve molluscs, tubular structures through which water enters and leaves the mantle cavity.

socket: A concavity for an articulation or joint.

spatulate: Spoon shaped; blade shaped, usually blunt-tipped.

sphincter: A circularly-arranged muscle used to close off any opening.

spicules: Minute calcium carbonate or silicon dioxide bodies which form the supporting skeleton of many sponges.

spine: A pointed process or outgrowth, stiff, sharp and pointed; in polychaetes, stout, spikelike setae.

spiniger: A seta that tapers to a fine point.

spinose: With spines.

spinous pocket: A pocketlike serration along the margin of the setae of some polychaetes.

spinule: A small spine.

spiral: Circling around a central axis in a curve of conical or cylindrical form.

spire: In gastropods; the upper whorls, from the apex to but not including the body whorl.

spongin: The fibrous network forming part or all of the skeleton of many sponges.

stellate: Star-shaped.

stigma (stigmata): One of many small slits in the pharyngeal wall of tunicates; a simple eyespot composed of a clump of pigment granules and light-sensitive protoplasm.

stria (striae): A fine line.

stylet: Needle or spearshaped, piercing structure associated with the mouthparts of proboscis of certain invertebrates.

stylocerite: A spine or rounded lobe on the lateral portion of the basal segment of antennules.

stylode: A small, fingerlike projection associated with a parapodium of a polychaete.

sub: A prefix indicating "almost" or "somewhat", as in subtriangular, meaning almost or somewhat triangular.

sub-biramous: In some polychaetes, the condition in which the notopodium is reduced to a short lobe with aciculum, above the neuropodium.

subdermal: Lying just beneath the epidermis, usually externally visible.

subequal: Almost but not quite equal.

subhepatic region: Area below the hepatic region; ventral portion of the carapace near the anterolateral border.

suborbital spine: Spine on the ventral rim of the orbit.

subulate: Awl-shaped; elongate, slender and tapering to a fine point.

sulcus: A furrow or groove; slit or fissure.

superior: The highest or more dorsal of two or more structures.

supero marginal: The upper surface of the edge or margin.

supraorbital spine: Spine posterior and dorsal to the orbit.

suture: Irregular line of juncture; in gastropods, a line or groove where one whorl touches the other.

symbiosis: A close association between different species in a mutually advantageous situation.

symmetry: Correspondence in size, shape and relative position of parts.

synonym: The same meaning; a different name for the same species.

syntype: Specimens of equal rank upon which a species description is based.

taxodont teeth: Numerous similar teeth along the hinge area of a bivalve.

teeth: In a bivalve, the shelly protuberances on the inside dorsal margin of a valve which fit into corresponding notches of the opposite valve.

teleoconch: The entire gastropod shell excluding the protoconch.

telson: The last body segment of many crustaceans.

tentacle: A long, cylindrical or threadlike protuberance, usually arising from an anterior body part; sensory structure.

tentacular cirrus (cirri): Long, slender sensory process arising from the peristomium or cephalized segments.

tergite: Dorsal plate of an arthropod segment.

tergum (terga): A distal calcareous plate in the barnacle skeleton; the terga, in combination with the scuta, close off the oral aperture.

test: A protective shell; rigid calcareous skeleton composed of numerous plates in the echinoderm class Echinoidea.

thelycum: In some crustaceans, external seminal receptable on the sternum of the thorax.

thorax: Anterior region of the body, posterior to the head; region between the head and abdomen.

threads: In bivalves, the silky fibers of the byssus; or fine surface elevations on the shell.

tibia: One of the leg segments of arthropods.

topotype: A specimen collected at the same locality the original type was taken from.

torsion: A twisting around; in gastropods, a developmental phenomenon which brings the mantle cavity to the front of the body.

trepan: Chitinized, anterior-tooth portion of the eversible pharynx of some polychaetes.

tridentate: With three teeth.

trigonal: Triangular in shape.

truncate: Being cut off squarely at the end.

trunk: The main stem or body.

tube feet: Podia; small fluid-filled muscular tubes in echinoderms which project outside the body and are used for grasping, locomotion and respiration.

tubercules: Small, raised projections.

turbinate: Conical with a round base; turbin shaped.

turriculate: Turret or tower shaped; in gastropods; having a long spire with somewhat shouldered whorls.

type: A specimen that serves as a basis for the original description and name.

umbilicus: In gastropods; the small hole or depression in the base of the body whorl.

umbo (umbones): The prominences on either side of the hinge region in a bivalve mollusc; the region of earliest or juvenile growth of a bivalve.

unciniger: Segment with uncini.

uncinus (uncini): Small hooked or hooklike structure; small, hooked, deeply imbedded setae of some polychaetes.

unidentate: Terminating in a simple point.

uniramous: Having a single division; with setae on only one parapodial ramus.

univalve: One valve, as opposed to bivalve; a gastropod.

urogastric lobe: Also known as the genital region; posteromedial lobe of the gastric region.

valve: In molluscs; one of the shell halves of a clam.

varix (varices): A raised rib on a gastropod shell.

veliger: The free-swimming larva of most marine gastropods, Scaphopoda and Pelecypoda.

ventral: Pertaining to the lower surface or opposite of dorsal.

visceral mass: In the molluscs; the portion of the body containing the internal organs; excluding the foot and mantle.

vitreous: Glassy

viviparous: Bearing live young.

water vascular system: System of fluid-filled closed tubes and ducts found in echinoderms; the system is filled with seawater containing some protein; functions as a respiratory transit system and as a hydrostatic skeleton for the tube feet.

whorl: One complete turn of a snail shell.

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